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Comparative-Effectiveness Research

Development and Psychometric Testing of the Caregiver Self-Efficacy in Contributing to Patient Self-Care Scale

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ABSTRACT

Objectives: Caregiver self-efficacy—a caregiver's belief in his/her ability to contribute to patient self-care—is associated with better patient and caregiver outcomes in single chronic conditions. It is, however, unknown if caregiver self-efficacy improves patient and caregiver outcomes in multiple chronic conditions (MCCs) because there is no instrument to measure this variable. We developed the 10-item Caregiver Self-Efficacy in Contributing to patient Self-Care (CSE-CSC) scale for that purpose, and we tested its psychometric characteristics in caregivers of patients with MCCs.

Methods: In this cross-sectional multisite study, we tested the structural validity of the CSE-CSC scale with exploratory and confirmatory factor analysis, and we tested construct validity by correlating CSE-CSC scores with those of the Caregiver Contributions to Self-Care of Chronic Illness Inventory. We also tested reliability, and precision of the CSE-CSC scale.

Results: The 358 enrolled caregivers (mean age 54.6 years; 71.5% female) cared for patients with an average of 3.2 chronic conditions. Structural validity was good, and it showed 2 factors within the scale. Construct validity showed significant correlations between scores of the CSE-CSC scale and the Caregiver Contributions to Self-Care of Chronic Illness Inventory. Reliability coefficients were between 0.90 and 0.97. Measurement error yielded satisfactory results.

Conclusions: The CSE-CSC scale is valid, reliable, and precise in measuring caregiver self-efficacy in contributing to patient self-care in MCCs. Because caregiver self-efficacy is a modifiable variable, the CSE-CSC scale can be used in clinical practice and research to improve patient and caregiver outcomes.

Keywords: Caregiver, psychometric, questionnaire, reliability, self care, self efficacy, survey, validity

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Introduction

Multiple chronic conditions (MCCs), defined as a clinical condition in which 2 or more chronic illnesses affect a person at the same time,[1] are highly prevalent worldwide. In the United States, 1 in 4 persons is affected by MCCs, and in Europe the prevalence is estimated at one-third, with the highest prevalence in older individuals.[2]

The management of MCCs is complex, and it requires chronically ill individuals and their families to perform several self-care behaviors. Self-care has been defined as a natural decision-making process aimed at preserving health and controlling illnesses.[3] In the setting of chronic illnesses, self-care involves 3 interrelated behavioral processes: self-care maintenance, self-care monitoring, and self-care management.[3,4] Self-care maintenance involves the daily, routine activities used to keep a chronic illness stable (eg, taking medication as prescribed). Self-care monitoring involves the continual process of watching oneself to detect signs and symptoms of the illness (eg, monitoring blood sugar). Self-care management is the response to signs and symptoms when they occur (eg, taking an extra medication for symptoms). All these behaviors involve a naturalistic decision-making process that reflects automatic, impulsive, and contextual decisions that people make in typically ambiguous situations, where the options are often vague.[3]

In single chronic conditions, such as heart failure (HF) and diabetes, self-care has been shown to influence health and economic outcomes, including improving the quality of life,[5] preventing disease complications,[6] and reducing rehospitalizations.[7] Despite this evidence, self-care is not performed sufficiently in several chronic conditions.[8–10] In those situations, an informal caregiver, such as a family member, is extremely helpful in contributing to the patient's self-care process.[11]

Caregiver contributions (CCs) to patients' self-care was conceptualized as the process of recommending to (or substituting for) the patient in performing behaviors aimed at maintaining the stability of the illness, facilitating the monitoring of symptoms, and responding to signs and symptoms of an exacerbation.[12] There is evidence that CCs to self-care are associated with positive patient outcomes, such as better adherence to medication,[13,14] fewer

emergency department visits,[15] and healthier patient behaviors.[13] Several variables at caregiver, patient, and dyadic levels[16–18] have been conceptualized and are found to impact CC to patient self-care, but all those contributors could be influenced by caregiver self-efficacy. Bandura[19] defined self-efficacy as individuals' beliefs about their ability to achieve positive outcomes by performing a course of action, irrespective of the challenges and difficulties involved.[20] Self-efficacy drives behavioral actions through increasing cognitive understanding and control over the situation, upturning self-regulatory power, and reducing emotional reaction toward the difficulties encountered.[20] As such, self-efficacy shapes one's level of commitment and persistence to manage a specific situation.[20]

Caregiver self-efficacy has been defined as the caregiver's belief in his or her ability to contribute to patient self-care.[12] Several studies in single chronic conditions have found that better caregiver self-efficacy is associated not only with better patient self-care and consequently better patient outcomes, but also with better caregiver outcomes. For example, in patients with lung cancer, better caregiver self-efficacy was associated with better symptom control and quality of life.[21] In caregivers of patients with Alzheimer disease, better self-efficacy was associated with lower depression and burden.[22,23] There is also evidence, from randomized controlled trials, that caregiver self-efficacy is a key modifiable characteristic that can be targeted with psychoeducational interventions.[24,25]

Although caregiver self-efficacy has been found to be associated with positive health outcomes for both patients with chronic conditions and their caregivers, so far an instrument to measure caregiver self-efficacy has been explored only in single chronic conditions, such as HF and dementia.[26–28] It has not been tested in situations of MCCs. Consequently, an instrument to measure caregiver self-efficacy in contributing to patient self-care of chronic illness would be helpful in this context.

Objective

To develop and test the psychometric characteristics (validity and reliability) of the Caregiver Self-Efficacy in Contributing to Patient Self-Care (CSE-CSC) Scale in MCCs.

Methods

Instrument Development

The CSE-CSC scale was derived from the Self-Care Self-Efficacy Scale (SC-SES),[29] an instrument that measures patient self-efficacy in performing self-care behaviors with a single disease and MCCs. Based on the Middle-Range Theory of Self-Care of Chronic Illness,[3] the CSE-CSC scale was proposed to measure caregiver self-efficacy in contributing to patient self-care maintenance, monitoring, and management of chronic illness. The CSE-CSC scale includes the same items as the SC-SES, except that the wording of the introduction and the items in the scale has been changed to make it clear that the scale investigates the caregiver self-efficacy in contributing to patient self-care in the context of MCCs. For example, in the SC-SES, patients are asked to report the extent to which they feel confident about keeping their disease stable and without symptoms or about following the treatment plan that clinicians have given them. In the CSE-CSC scale, caregivers are asked, in reference to the person they care for, to report the extent to which they feel confident about keeping the patient's diseases stable or about helping the patient to follow the prescribed treatment plan. This procedure of changing the patient version of an instrument into a caregiver version has been used extensively in previous studies.[26,30,31] Like the SC-SES, the CSE-CSC scale uses a 5-point Likert format, with responses from "not confident" to "very confident." The CSE-CSC score is standardized on a scale of 0 to 100, where higher scores mean higher caregiver self-efficacy in contributing to self-care of a patient with MCC.

The CSE-CSC scale was developed in English and then translated to Italian by 2 independent Italian researchers who were fluent in English and had expertise in chronic diseases. The Italian translation of the CSE-CSC scale was then translated back to English by a bilingual researcher with expertise in medical English. After this back-translation, minimal refinements were made to the SC-SES developed to ensure that the intended meaning was retained between the 2 versions. After translation, cognitive interviews were conducted with 10 caregivers of patients with MCC using think-aloud techniques to verify if all items of the CSE-CSC scale were easily and correctly understood. Those interviews demonstrated that all items were correctly understood.

Sample and Settings

To test the psychometric characteristics of the instrument, we used the baseline data of the ongoing Self-care Of patient and caregiver DyAds in multiple chronic conditions: a LongITudinal study, a longitudinal multicenter investigation, that aims to describe patient self-care and CC to patients' self-care in MCCs. The detailed study protocol was published by De Maria et al.[32] In brief, in the Self-care Of patient and caregiver DyAds in multiple chronic conditions: a LongITudinal study, we enroll patients aged 65 years or older, with HF or diabetes or chronic obstructive pulmonary disease and at least one other chronic illness, in community and outpatient settings—except for patients with cancer or dementia. We excluded patients with dementia because the presence of cognitive deficits could make responses to self-reported questionnaires unreliable.[33] We did not include patients affected by cancer in association with other chronic conditions because the specific medical (chemotherapy and radiotherapy) and surgical treatments for cancer have a dominant effect on health-related quality of life.[34]

We also enroll each patient's informal caregivers with the following characteristics: ≥18 years old, identified by the patient as the primary informal caregiver (person, family or otherwise, who takes the responsibility and provides majority informal care to the patient), and willing to sign the informed consent form. We enrolled only matching patient and caregiver dyads. Therefore, if one member of the dyad refused to participate in the study, the other member also was excluded. Patient and caregiver dyads were enrolled in 7 regions of central and southern Italy. A sample of 7 caregivers per item was needed to allow adequate inference in exploratory or confirmative factor analysis.[35,36] Considering the number of CSE-CSC scale items,[10] a sample of 70 caregivers would have been adequate to address the main study objective; however, we enrolled 358 participants to support a more stable analysis.

Data Collection

A total of 358 caregivers were enrolled by research assistants, who first identified potential participants on the basis of the inclusion criteria. They explained the aims of the study and obtained the participants' informed consent. Data collection took place during routine outpatient visits or directly at the patient's and caregiver's home.

Instruments

The Caregiver Contribution to Self-Care of Chronic Illness Inventory (CC-SC-CII) is a 19-item instrument used to measure CC to

self-care in chronic conditions.[37] It consists of 3 separate scales: 7 CCs to self-care maintenance items measure how often a caregiver recommended the patient to adopt behaviors aimed at maintaining physical and mental stability of a chronic condition, 5 CCs to self-care monitoring items measure how often a caregiver recommended the patient to monitor signs and symptoms of his or her chronic illness, and 7 CC to self-care management items measure how often a caregiver contributed to the recognition or interpretation of symptoms and responded to exacerbation of chronic illness symptoms.

Psychometric analysis of the CC-SC-CII in our study demonstrated that it has good construct validity (comparative fit index [CFI] ranging between 0.936 and 0.981 among the 3 scales) and reliability (Cronbach's alpha and factor determinacy coefficients ≥ 0.765 for the 3 scales).[37] For responses, the CC-SC-CII uses a 5-point Likert format ranging between "never" and "always." Each CC-SC-CII scale has a standardized 0 to 100 score, with higher scores meaning better CC to patient self-care. The CC-SC-CII was used in this study for construct validity via hypothesis testing, because higher scores in caregiver self-efficacy are associated with better CC to self-care.[12] We also collected sociodemographic characteristics of the caregivers (ie, age, gender, education, years of caregiving) with a specific questionnaire.

Data Analysis

Data analysis was conducted in 6 phases. First, we used descriptive statistics, including means, standard deviations (SDs), frequencies, percentages, skewness, and kurtosis, to analyze the sociodemographic characteristics of participants, the scale scores, and the univariate distribution of scale items.

Second, we used Bartlett test of sphericity and the Kaiser–Meyer–Olkin (KMO) test to examine the adequacy of the sample and the suitability of data for factor analysis, which we used to test the structural (factorial) validity of the CSE-CSC scale. Bartlett test of sphericity should have a significant chi-square; KMO should have a value ≥0.70.[38]

Third, according to classical test theory,[39] we tested the structural validity of the CSE-CSC scale with a cross-validation procedure, using both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). In particular, we randomly split the entire sample into 2 subsamples, named A and B. These 2 subsamples were equivalent in term of age (t (358) = −0.174 P=.7), gender (χ^2 [1358] = 0.234, P=.64), and education (χ^2 [1358] = 0.655, P=.37). In subsample A, to address the issue of the number of latent dimensions underlying the CSE-CSC scale's items, EFA was performed. To define the number of plausible factors to extract, parallel analysis was performed on the total sample.[40–43]

In subsample B, we validated the factorial solution obtained from EFA with CFA.[44] This approach has been applied successfully in several other studies[45,46] and also with instruments that measure self-care and self-efficacy in self-care.[47] Because the expected factors were assumed to correlate, EFA was performed with the maximum likelihood extraction method and Geomin rotation.[48] Owing to the normal distribution of CSE-CSC scale items, we used a maximum likelihood estimator.[48]

The factorial solution obtained by EFA in subsample A was tested with CFA in subsample B. To evaluate model fit, we adopted a multifaceted approach that considered goodness-of-fit indices,[49,50] CFI,[51] the Tucker–Lewis Index (TLI),[52] the root mean square error of approximation (RMSEA),[53] the standardized root mean square residual (SRMR),[54] and chi-square significance. CFI and TLI should have values ≥0.90 or better ≥0.95[55]; RMSEA values ≤0.08 or ≤0.05 indicate a good fit, and the rejection of the null hypothesis (for P<.05) associated with its 90% confidence interval[56,57] and P>.05 for the test of close-fit. SRMR should have values ≤0.08. The chi-square test was also interpreted together with the above indices. The model's misfit was improved by considering the eventual residual covariances justified to theoretical and methodological reasons. After performing EFA and CFA on the 2 subsamples, to obtain solid estimates for the final loadings, we re-ran CFA on the entire sample. Finally, because the 2 factors extracted from EFA and CFA were significantly correlated, we examined a second-order hierarchical factor loading of those 2 factors.

Fourth, we tested the CSE-CSC scale's construct validity via hypothesis testing by examining the correlation between the scores of the CSE-CSC scale and the fourth CC-SC-CII scale using the Pearson correlation coefficient r (2 tailed). Correlation coefficients of 0.10, 0.30, and 0.50 were considered to be small, medium, and large, respectively.[58] We hypothesized that caregiver self-efficacy would be positively correlated from moderate to strong with CC to self-care, as reported in the theory[12] and in previous studies.[59,60]

Fifth, we estimated the reliability of internal consistency of the CSE-CSC scale. Specifically, we computed the composite reliability coefficient[61] and the factor score determinacy[48] for each first- and second-order factor extracted from CFA, and we computed the global reliability index for multidimensional scales[62] and Cronbach's alpha coefficient[63] for the overall scale. All these reliability estimates should have a value >0.70.[64]

Finally, we evaluated the measurement error of the CSE-CSC scale by computing the standard error of measurement (SEM) and the smallest detectable change (SDC). SEM was computed with the following formula: SD × √(1 − reliability coefficient).[65] Here, SD was the SD of the CSE-CSC scale score, and the reliability coefficient was the Cronbach's alpha coefficient. If SEM has a value <SD/2, the instrument is considered precise.[66] SDC was computed with the following formula: 1.96 × √2 × SEM.[66] SDC value indicates how many points in the CSE-CSC scale are considered clinically significant.

Mplus software version 8.2 (Muthén and Muthén, Los Angeles, CA) was used for the factorial analyses, and SPSS Statistics version 22 (IBM Corp, Armonk, NY) was used for the descriptive statistics.

Results

Sample Characteristics

Of the 417 eligible caregivers, 367 (88%) agreed to participate, and 50 (12%) declined because of a lack of time or interest. Nine participants were identified as outliers and were excluded from all analysis, as recommended by Tabachnich and Fidel (2007),[67] because they were influential data points in factor analyses. The outliers showed a low level of education (6 participants had completed middle school) and were mainly older adults (7 participants were aged older than 70 years). Therefore, we hypothesized that education and age, often associated with cognitive impairment, led these participants to not fully understand the content of some items. Consequently, all analyses were performed with a final sample of 358 caregivers. Most caregivers were female (71.5%), were employed (68.2%), and had a medium to high level of education (88.4%) (Table 1). They were children (57.8%) or spouse (31.1%) of the patients, and majority (55%) lived with the patients. The caregivers provided 25.5 hours of care per week, on average, and they had been providing care for an average of 8.9 years. The patients were mostly females (53.9%),

Table 1. Clinical and sociodemographic characteristics of caregivers and patients (N = 358).

Characteristics	Caregiver		Patient	
	M (range)	± SD	M (range)	± SD
Age	54.6 (19-86)	15.1	76.6 (65-93)	7.3
	n	%	n	%
Sex				
Female	256	71.5	193	53.9
Male	102	28.5	165	46.1
Marital status				
Married	252	70.4	229	64
Never married	75	20.9	11	3
Divorced	25	7	12	3.4
Widowed	6	1.7	106	29.6
Education				
Illiterate	2	0.6	8	2.2
Elementary	39	10.9	200	55.9
Middle/professional school	118	32.9	97	27.1
High school	138	38.5	39	10.9
University	62	17	14	3.9
Employment status				
Employed	192	68.2	15	4.3
Retired/unemployed	166	31.8	343	95.7
Income				
Have less than needed to make ends meet	15	4.2	18	5
Have enough to make ends meet	291	81.3	304	84.9
Have more than needed to make ends meet	52	14.5	36	10.1
Relationship with patient				
Spouse/partner	111	31.1	-	-
Child	207	57.8	-	-
Grandchild	28	7.8	-	-
Sister/brother/friend	12	3.3	-	-
Living with patient				
No	161	45	-	-
Yes	197	55	-	-
Secondary caregiver				
No	146	40.8	-	-
Yes	212	59.2	-	-
	M (range)	± SD	M (range)	± SD
Caregiving hours per wk	25.5 (1-168)	36.1	-	-
Years of caregiving	8.9(1-45)	7.2	-	-
Chronic illnesses (number)	-	-	3.2 (2-9)	1.3

M indicates mean; SD, standard deviation.

with a mean age of 76.6 years and a low educational level (55.9%), and they were afflicted with 3.2 chronic conditions on average (Table 1).

Descriptive Analysis of Scale Items

Table 2 shows the descriptive statistics of the CSE-CSC scale items. All the items were normally distributed. The item with the highest score was "Follow the treatment plan he/she has been given." The item with the lowest score was "Can keep him/her stable and free of chronic illness symptoms."

Structural and Construct Validity of the CSE-CSC Scale

Because the Bartlett test of sphericity was significant ($P<.001$) and KMO index was 0.84, the data were suitable for factor analysis. Parallel analysis suggested that a 2-factor solution was the more adequate for the data set; consequently, we tested the 2-factor solution on subsample A. Table 3 shows EFA results: all the primary factor loadings were adequate (>0.30). They ranged from 0.487 ("Can keep him/her stable and free of chronic illness symptoms") to 1.024 ("Doing something to relieve his/her symptoms"). They were loaded with 5 items each. The fit indices of this solution are reported in row 1 of Table 4, and they yielded a partial misfit for the RMSEA.

The model identified by EFA was replicated on subsample B with CFA, obtaining acceptable fit indices (see row 2 of Table 4). On the basis of the item content, the first factor was labeled "Self-efficacy in self-care maintenance and monitoring," and the second was labeled "Self-efficacy in self-care management." Scrutinizing the modification indices revealed that the partial misfit was due to an excessive covariance between item 2 ("Follow the treatment plan he/she has been given") and item 3 ("Persist in following the

Table 2. Descriptive statistics of individual items, factors, and the total score of the CSE-CSC Scale (N = 358).

Items of the CSE-CSC scale	M	SD	Skewness	Kurtosis
In general, in reference to the person you care for, how confident you are that you can:				
1. Keep the illness of the person you care for stable and free of symptoms?	3.447	0.965	0.300	−0.671
2. Follow the treatment plan that has been given to the person you care for?	4.140	1.000	−0.736	−0.571
3. Persist in following the treatment plan even when difficult?	3.913	1.051	−0.537	−0.619
4. Routinely monitor the condition of the person you care for?	3.930	1.060	−0.567	-0.625
5. Persist in routinely monitoring the condition of the person you care for even when difficult?	3.807	1.063	−0.464	−0.590
6. Recognize changes in the health of the person you care for if they occur?	3.927	0.941	−0.279	−0.994
7. Evaluate the importance of symptoms?	3.911	0.978	−0.361	−0.796
8. Do something to relieve symptoms of the person you care for?	3.894	1.007	−0.561	−0.369
9. Persist in finding a remedy for symptoms of the person you care for even when difficult?	3.723	1.115	−0.521	−0.569
10. Evaluate how well a remedy works?	3.824	1.045	−0.485	−0.491
Illness management factor	19.237	4.389	−0.491	−0.632
Symptom management factor	19.279	4.425	−0.367	−0.374
Total score of CSE-CSC	71.291	20.728	−0.347	−0.728

Note. Item numbering reflects the sequence in the scale.
CSE-CSC indicates Caregiver Self-Efficacy in Contributing to Patient Self-Care Scale; M, mean; SD, standard deviation.

treatment plan even when difficult") and between item 6 ("Recognizing changes in his/her health if they occur") and item 7 ("Evaluating the importance of his/her symptoms"). There are solid methodological reasons that justify these error covariances.[68] All of these covariances are related to items with an adjacent position in the scale (items 2 and 3 and items 6 and 7). Adjacent pairs of positively worded items may show a pattern of increasing correlation that decreases with increasing inter-item distance, described by Weijters et al[69] as a "proximity" effect. Error covariance can be used to account for the extra source of item covariance introduced by item proximity.[70] It is worth noting that all these covariances were also generalized across the total sample. The model specified with these covariances obtained good fit indices (see row 3 of Table 4).

CFA was run on the entire sample of 358 participants and with the same specifications as CFA conducted on subsample B. It identified a model with good fit indices, reported in row 4 of Table 4. Because the 2 CFA factors were significantly correlated at 0.852, we examined a second-order hierarchical model that produced a good fit as well: χ^2 (33, N = 358) = 92.080, $P<.001$, CFI = 0.968, TLI = 0.956, RMSEA = 0.071 (90% confidence interval = 0.054-0.088), $P=.023$, SRMR = 0.051 (row 5 of Table 4). All factor loadings were significant, ranging from 0.659 to 0.932 (Fig. 1). All residual covariances were also generalized across the total sample.

The construct validity of the CSE-CSC scale was supportive as well. The Pearson correlation coefficients between the CSE-CSC scale scores and the CC to patients' self-care maintenance, monitoring, and management were moderate to high: $r = 0.452$ ($P=.01$), $r = 0.582$ ($P=.01$), and r = 0.609 ($P=.01$), respectively.

Internal Consistency Reliability and Precision of the CSE-CSC Scale

The internal consistency reliability of the CSE-CSC scale was supportive. The composite reliability coefficients for the self-efficacy in self-care maintenance and monitoring factor, the self-efficacy in self-care management factor, and the overall CSE-CSC scale were 0.904, 0.911, and 0.951, respectively. The factor score determinacies for the self-efficacy in self-care maintenance and monitoring factor, the self-efficacy in self-care management factor, and the overall scale were 0.967, 0.963, and 0.937, respectively. The global reliability index for the multidimensional scale was 0.923, and the Cronbach's alpha coefficient was 0.942 for the whole scale.

SEM of the CSE-CSC scale resulted in 1.36 for the self-efficacy in self-care maintenance and monitoring factor, 1.32 for the self-efficacy in self-care management factor, and 6.19 for the total CSE-CSC score. These measures were considered adequate. SDC resulted in 3.23 for the self-efficacy in self-care maintenance and monitoring factor, 3.19 for the self-efficacy in self-care management factor, and 6.19 for the total CSE-CSC score. SDC coefficients evidence the points in the CSE-CSC scale, at factor and scale levels, that we can consider for a meaningful change.

Discussion

This study aimed to develop an CSE-CSC scale and test its psychometric characteristics. To the best of our knowledge, the CSE-CSC scale is the first instrument that measures the self-efficacy in contributing to patient's self-care in MCCs. We found that the CSE-CSC scale showed good validity and reliability in this sample of caregivers of patients with MCC.

Regarding structural validity, we used both EFA and CFA to ensure a more solid validation. In the CSE-CSC scale, we found 2 distinct factors that referred to the caregiver's self-efficacy. One was managing the patient's illness (eg, monitoring patient conditions), and the other was managing the patient's symptoms (eg, doing something to relieve symptoms). In the SC-SES, from which this scale was derived, only one such factor was identified. Instead, the factorial structure of the CSE-CSC scale is similar to the Self-Care Confidence scale of the Caregiver Contribution to Self-Care

Table 3. Exploratory factor analysis and item factor loadings for the Caregiver Self-Efficacy in Contributing to Patient Self-Care Scale (N = 179).

Items of the Caregiver Self-Efficacy in Contributing to Patient Self-Care Scale	F1 loading	F2 loading
In general, in reference to the person you care for, how confident are you regarding:		
1. Can keep him/her stable and free of chronic illness symptoms?	0.487*	0.181
2. Follow the treatment plan him/her have been given?	0.960*	−0.123
3. Persist in following the treatment plan even when difficult?	0.940*	0.006
4. Monitor his/her condition routinely?	0.690*	0.152
5. Persist in routinely monitoring his/her condition even when difficult?	0.627*	0.323*
6. Recognizing changes in his/her health if they occur?	0.349*	0.507*
7. Evaluating the importance of his/her symptoms?	0.071	0.794*
8. Doing something to relieve his/her symptoms?	−0.179	1.024*
9. Persisting in finding a remedy for his/her symptoms even when difficult?	0.003	0.911*
10. Evaluating how well a remedy works?	0.095	0.714*

F1 indicates self-efficacy in self-care maintenance and monitoring; F2, self-efficacy in self-care management.
*$P<.05$.

of HF Index,[26] which measures caregiver self-efficacy in contributing to HF self-care. In fact, in this instrument, a first factor named "basic confidence," including behaviors related to illness management (eg, following the treatment plan), and a second factor named "advanced confidence," including behaviors related to the management of symptoms (eg, keeping the patient free from HF symptoms), were found.

The fit model of CFA was improved by the estimations of residual covariances between 2 item pairs: between item 2 ("Follow the treatment plan he/she has been given") and item 3 ("Persist in following the treatment plan even when difficult") and between item 6 ("Recognizing changes in his/her health if they occur") and item 7 ("Evaluating the importance of his/her symptoms"). These excessive correlations between these 2 item pairs could be justified by the fact that both item 2 and item 3 pertain to following the treatment plan, and both item 6 and item 7 are related to self-efficacy in symptoms. According to Bagozzi[71] and Fornell[72] the covariances between item residuals can be allowed if this is methodologically or theoretically reasonable, as in our case.

Construct validity of the CSE-CSC scale was demonstrated via hypothesis testing through moderate and strong significantly positive correlations with the CC-SC-CII scale scores. As described in the theoretical[3,12] and empirical literature,[73,74] self-efficacy is an important predictor of CC to self-care. Consequently, this finding gives strength to the existing theories and the available clinical evidence[73,74] on the role between self-efficacy and self-care.

Internal consistency reliability of the CSE-CSC scale, tested through both unidimensional and multidimensional indices, was optimal. This means that if we measure either the 2 dimensions of the CSE-CSC scale or the entire caregiver self-efficacy, we can have reliable values. In addition, the precision of the instrument was good for the 2 dimensions and the entire scale, as SEM was <SD/2. The small detectable change of 6.19 for the entire scale score is informative of the minimum change in the scale score to have a clinically meaningful change.

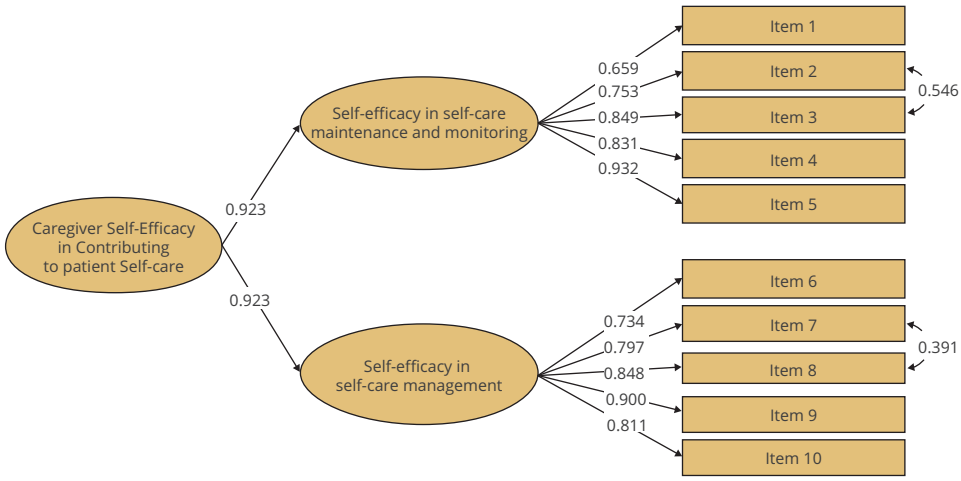
There are a couple of limitations that are worth considering in this study. First, although the factor structure of this scale was established by a cross-validation procedure, by exploring the factorial structure of the CSE-CSC scale with EFA and then by confirming the obtained factorial structure with CFA, we tested the instrument in a single convenience sample. Second, validation against more than one criterion, discriminant validity,

Table 4. Fit indices for the Caregiver Self-Efficacy in Contributing to Patient Self-Care Scale derived from EFA and CFA.

Statistical Models	N	χ^2	DF	P (χ^2)	TLI	CFI	SRMR	RMSEA (90% CI), P (RMSEA < 0.05)
EFA in subsample A	179	79.351	26	<.001	0.906	0.946	0.027	0.107 (0.081-0.134), P <.001
CFA in subsample B without residual covariances	179	115.069	34	<.001	0.889	0.916	0.046	0.115 (0.093-0.139), P <.001
CFA in subsample B with residual covariances	179	59.860	32	.002	0.960	0.971	0.037	0.070 (0.042-0.097), P =.114
CFA first order in total sample	358	87.614	32	<.001	0.958	0.970	0.037	0.070 (0.052-0.087), P =.031
CFA second order in total sample	358	92.080	33	<.001	0.956	0.968	0.051	0.071 (0.054-0.088), P =.023

CFA indicates confirmatory factor analysis; CFI, comparative fit index; CI, confidence interval; DF, degree of freedom; EFA, exploratory factor analysis; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual.

Figure 1. Graphical representation of the second-order hierarchical model (N = 358).



responsiveness, and test-retest reliability were not tested because it was not the principal aim of the study. Future studies are needed to verify these psychometric characteristics of the CSE-CSC scale.

Third, we excluded patients with severe health issues (ie, those with important cognitive deficits and cancer). In consideration of these 2 limitations, generalizability of our findings should be done with caution in other countries and in other caregiver populations. For these reasons, we recommend further testing of the CSE-CSC scale in samples enrolled in other countries and eventually affected by different health issues.

Our study might have important clinical and scientific implications. Clinicians could use the CSE-CSC scale to measure the extent to which caregivers feel confident in helping patients affected by MCCs to perform self-care. Because patient self-care and CC to self-care are associated with positive patient outcomes (eg, better quality of life, rehospitalizations),[5,7] it is important to identify variables that influence patient self-care and CC to self-care. Consequently, clinicians using the CSE-CSC scale can evaluate if caregiver self-efficacy is adequate, and in case it is not, they can support caregivers with tailored interventions aimed at improving their self-efficacy. From a scientific point of view, the use of the CSE-CSC scale in future studies, especially in randomized controlled trial, could be important to understand which interventions could improve caregiver self-efficacy.

Conclusions

This study gives evidence of validity, reliability, and precision to a new instrument that can be used in clinical practice and research to evaluate caregiver self-efficacy in contributing to self-care in MCCs. We recommend the use of the CSE-CSC scale in combination with the CC-SC-CII to better understand the relationship between caregivers' self-efficacy and their contributions to self-care in MCCs. In fact, although several studies on single chronic conditions (eg, HF) show that caregiver self-efficacy influences CC to self-care,[73] knowledge is poor on MCCs. Additionally, we recommend using the SC-SES used for patients in combination with the CSE-CSC scale. This would allow to perform dyadic analyses, which are important because caregivers and patients influence each other.

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