



Contents lists available at ScienceDirect

Heart & Lung

journal homepage: www.heartandlung.org

Psychometric properties of the Caregiver Preparedness Scale in caregivers of stroke survivors

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ARTICLE INFO

Article history:

Received 12 June 2014

Received in revised form

19 August 2014

Accepted 19 August 2014

Available online xxx

Keywords:

Caregivers

Preparedness

Psychometrics

Stroke

Validity

Reliability

ABSTRACT

Objective: To evaluate the psychometric characteristics of the Caregiver Preparedness Scale (CPS) in caregivers of stroke survivors.

Background: Caregiver preparedness can have an important impact on both the caregiver and the stroke survivor. The validity and reliability of the CPS has not been tested for the stroke-caregiver population. **Methods:** We used a cross-sectional design to study a sample of 156 caregivers of stroke survivors. Construct validity of the CPS was evaluated by confirmatory factor analysis (CFA). Internal consistency and test-retest reliability were also evaluated.

Results: Caregivers were, on average, 54 year old (SD = 13.2) and most were women (64.7%). CFA supported the unidimensionality of the scale (comparative fit index = 0.98). Reliability was also supported: item-reliability index and item-total correlations above 0.30; composite reliability index = 0.93; Cronbach's alpha = 0.94; factor score determinacy = 0.97; and test-retest reliability = 0.92.

Conclusion: The CPS is valid and reliable in caregivers of stroke survivors. Scores on this scale may assist health-care providers in identifying caregivers with less preparedness to provide specific interventions.

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Introduction

In the industrialized world, 25% of people aged 65–69 years and 50% of people aged 80–84 years are affected by chronic health conditions.¹ The majority of these older adults are cared for by informal caregivers such as family or friends in the community.² In the United States, approximately 43.5 million informal caregivers provide care to older adults with chronic disease.³ In Europe, 125

million people serve as informal caregivers for people with functional limitations in performing activities of daily living (ADL).^{4,5} In Italy, where this study was conducted, more than 500,000 older adults are cared for by informal caregivers in their home. The majority of older adults suffer from chronic and complex conditions (e.g., hypertension, heart disease, diabetes, stroke, depression, and cancer) and require assistance in daily care from their family members.⁶ The number of caregivers is expected to increase in the near future because the population is rapidly aging.⁷

Caregivers are important resources for health-care systems and society.^{8,9} In the United States, economic value of caregiving was estimated to be \$350 billion in 2006.⁹ Several studies, however, found that caregivers may not be well prepared to provide appropriate care, such as monitoring symptoms, coordinating care, or recognizing and intervening in case of complications.^{2,10,11} Less prepared caregivers worry about care,¹² feel burden, strain and tension,¹³ and experience mood disturbances.¹⁴ In addition, caregivers with less caregiving preparedness have poorer health than

Abbreviations: ADL, activities of daily living; CFA, confirmatory factor analysis; CFI, Comparative Fit Index; CPS, Caregiver Preparedness Scale; ICC, Intraclass Correlation Coefficient; RMSEA, Root Mean Square Error of Approximation; SRMR, Standardized Root Mean Square Residual; TLI, Tucker and Lewis's Incremental Index.

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those with better caregiving preparedness.¹⁵ In contrast, well-prepared caregivers with appropriate skills and knowledge in caring for their relatives are less depressed and anxious and have higher levels of hope.¹⁶

The majority of strokes, especially ischemic strokes, occur among older adults. The stroke incidence rate is estimated to be between 7.5 and 10.1 per 1000 persons.^{17,18} Stroke survivors are generally discharged home in a short period of time and require assistance in performing ADL, even after rehabilitation.¹⁹ Caregivers of stroke survivors play a pivotal role in assisting in the physical, cognitive and emotional needs of stroke survivors²⁰; however, they often feel unprepared for their new caregiver role.^{21,22} These issues can cause increased errors in care, duplication of services, and inappropriate or absent treatment for stroke survivors, and even increased risk for patients' readmission to hospital.²³ Several studies demonstrated that well-prepared caregivers can significantly influence stroke survivors' recovery and quality of life.^{16,24} Thus, it is important for health-care providers to evaluate preparedness of informal caregivers, especially when the caregiver is beginning the new role as caregiver.

To measure preparedness for caregiving, Archbold et al²⁵ developed the Caregiver Preparedness Scale (CPS). Caregiver preparedness was defined as perceived preparation of caregivers to care for the physical and emotional needs of the patient. The definition of caregiver preparedness includes the caregiver's perception of their ability to arrange for services for the care recipient and handle emergent situations. Although the CPS was not developed based on a theory of caregiver preparedness, it has been used to measure caregiver preparedness in several caregiver populations such as caregivers for patients with cancer,^{10,26} life-threatening illness,^{27,28} coronary artery disease,²⁹ and Parkinson's disease.¹²

Despite wide use of the CPS, to our knowledge only three studies have tested the factorial structure and reliability of the scale. The first study was conducted in the United States,²⁵ where the CPS was developed, with a sample of caregivers of older adults who required assistance to take medications or for ADL. The factorial structure of the CPS was tested with exploratory factor analysis, which generated one factor explaining 50% of CPS variance. Internal-consistency reliability of the CPS, tested with Cronbach's alpha, was 0.72 at 6 weeks and 0.71 at 9 months after hospital discharge. When the Cronbach's alpha is ≥ 0.70 the research instrument is considered reliable.³⁰

Researchers also tested the CPS for validity and reliability on caregivers of palliative care patients in two studies conducted in Australia and Sweden.^{26,27} In the Australian study, they evaluated the factorial validity of the CPS with Principal Components Analysis and again, a single factor emerged from the analysis that explained 66.7% of CPS variance. Internal-consistency reliability, estimated with Cronbach's alpha, was also adequate with a coefficient of 0.93. However, test-retest reliability, which is another way to test instrument reliability, was not performed in this study. In the Swedish study,²⁷ researchers used confirmatory factor analysis (CFA) to test the factorial validity of the scale and the results were good because fit indices, which indicate if the factorial structure of the scale fit the data, were adequate. In fact, the comparative fit index and the non-normed fit index were both 0.99 in this study. When these two indices are ≥ 0.95 , the factorial validity is adequate.³¹ In this study, the CPS was also shown to have concurrent validity with the Rewards of Caregiving Scale ($r = 0.76$; $p < 0.001$) and the Caregiver Competence Scale ($r = 0.34$; $p < 0.001$). In addition, internal consistency reliability tested with Cronbach's alpha was adequate (0.94), as well as test-retest reliability (0.70) between the baseline and the 6-week follow-up.

Although the CPS has been used to measure caregiver preparedness in stroke caregivers,³² its psychometric properties have

not been tested in this population. This is an important limitation for the use of the CPS in research and clinical practice because instrument validity and reliability may vary across populations.³³ So far, the psychometric properties of the CPS have been tested only on caregivers of older adults and caregivers of palliative care patients, but preparedness in these two populations may differ from preparedness in stroke caregivers. This difference may influence the factorial validity and reliability of an instrument that need to be evaluated to understand if the instrument measures the intended variable with an acceptable measurement error.³⁴ Therefore, the purpose this study was to evaluate the factorial structure and reliability of the CPS for caregivers of stroke survivors.

Methods

Design

We used a cross-sectional design with a 2-week follow-up for test-retest reliability to conduct this study.

Ethical considerations

The Institutional Review Board at each Hospital where caregivers and stroke survivors were enrolled approved the study. All caregivers and stroke survivors participating in the study provided written informed consent.

Sample and settings

Using a convenience-sampling strategy, we recruited caregivers 3 months after stroke survivors had been discharged home from a total of 10 rehabilitation hospitals located in the following central and southern cities in Italy: Viterbo, Tivoli, Rome, Grottaferrata, Potenza, Guidonia, Cosenza, Ragusa, Naples, and Taranto. Caregivers were asked to be enrolled in the study if they met the following inclusion criteria: 1) being identified as the main informal caregiver by the stroke survivor without receiving any money compensation; and 2) being willing to provide written consent to participate. Caregivers were excluded from enrollment if their stroke patients: 1) had been previously diagnosed with physical/motor disorders such as amyotrophic lateral sclerosis, multiple sclerosis, or Parkinson's disease; 2) had a cancer or severe organ failure known to be associated with poor quality of life; 3) had aphasia, reduced level of consciousness, or a significant cognitive impairment (not oriented to place and people); 4) were not willing to sign the informed consent form. We chose these criteria to ensure that we specifically tested the psychometric characteristics of the CPS in a more homogeneous stroke-caregiver population, rather than in a more heterogeneous population of caregivers. These criteria have been adopted in prior studies.^{35–37}

Measures

Caregiver Preparedness Scale.²⁵ This instrument includes eight items on caregiver preparedness to care for a patient's physical and emotional needs, setting up services, coping with the stress of caregiving, making caregiving activities pleasant for the caregiver and the stroke survivor, responding and managing emergencies, getting help and information from the health care system, and overall preparedness. Examples of the questions on the scale are "How well prepared do you think you are to take care of your family member's physical needs?" and "How well prepared do you think you are to get the help and information you need from the Health Care System?" Each item is rated between 0 (Not at all prepared) to 4 (Very well prepared), and items are summed for a total score that

can range from 0 to 32, with higher scores indicative of feeling better prepared for the caregiving role.

Before its use in the Italian population, two nurses with expertise in stroke care and fluent in English and Italian translated the CPS from English into Italian. Then, a bilingual English teacher, with expertise in medical translation, back-translated the Italian version into English. The translator was blinded to the original version. The back-translated version of the CPS was checked by the scale developer (Dr. Patricia Archbold) to assess if the original item content was reflected well in the Italian version of the CPS. We then performed minimal modification. The above translation/back-translation procedure was successfully used in other studies.^{38,39}

Caregiver socio-demographic characteristics included gender, age, marital status, education, relationship with the patient, and living condition. We collected these characteristics data using a specific questionnaire developed by the research team. Trained research assistants abstracted stroke-survivor socio-demographic and clinical data from patients' medical records.

Procedures of data collection

We approached caregivers and stroke survivors for enrollment on the day of patient's discharge from the rehabilitation hospital. After identifying potential participants based on inclusion and exclusion criteria, research assistants met caregivers and stroke survivors and explained the aim of the study and the procedure for data collection. Specifically, research assistants informed caregivers and stroke survivors that after signing the informed-consent form, the same research assistant would collect stroke survivor's clinical data from the medical record and would contact them for the whole data collection at 3 months from the patient's discharge. Research assistants completed data collection at 3 months at the caregiver's house after making an appointment. We decided to administer the research tool at 3 months from patient's discharge to test the CPS in a stroke caregiver population with at least minimal experience in caregiving. Two weeks after data collection at 3 months, all caregivers received a telephone call for the re-administration of the CPS for test-retest. A 2-week interval is considered a standard for test-retest reliability in several nursing research textbooks.^{33,40}

Data analysis

We used SPSS 19.0 and Mplus 7.0 to analyze data in this study. For all analyses, *p* value less than 0.05 was considered statistically significant. We used descriptive statistics to analyze socio-demographic and clinical data (mean, standard deviation, and frequencies) and each item of the CPS (mean, standard deviation, skewness and kurtosis). The factorial structure of the CPS was evaluated by CFA with a maximum likelihood procedure.

To evaluate CFA solutions, we considered the following fit indices: (a) chi square, (b) Comparative Fit Index (CFI),⁴¹ (c) Tucker and Lewis's Incremental Index (TLI),⁴² (d) Root Mean Square Error of Approximation (RMSEA),⁴³ and (d) Standardized Root Mean Square Residual (SRMR).⁴⁴

We tested CPS internal-consistency reliability with item and composite reliability indicators recommended by Fornell and Larcker^{45–47} and with *traditional* indices based on classical test theory, such as Cronbach's alpha, item-total correlation, and Cronbach's alpha if item deleted. We also tested internal-consistency reliability with the factor score determinacy coefficient,⁴⁸ which is an estimate of the internal consistency of a factor solution; it should be equal to or higher than 0.70 as for Cronbach's alpha.⁴⁸ Test-retest reliability was conducted using Intraclass Correlation Coefficient (ICC).

Results

Sociodemographic characteristics of caregivers and stroke survivors

A total of 170 caregivers and stroke survivors were approached and 156 gave the consent to be enrolled in the study. We believe the sample of 156 adequately satisfies the established criteria for CFA, considering the simplicity and the parsimony of the model we tested. The average age of caregivers was 54 years (SD = 13.2) and most were women (64.7%); 78% were married and their level of education was equally distributed among participants. The majority (90%) of caregivers were spouses or adult children, and over half (58%) lived with stroke survivors (Table 1).

On average, stroke survivors were 70 years old (SD = 11.6) and men and women were equally distributed in the sample. Most had experienced ischemic stroke. The majority were married and their education level was low (Table 2). Stroke survivors had hypertension (69.2%), hypercholesterolemia (31.4%), and diabetes (33.3%), among the most common comorbid conditions. They also suffered from more than one chronic condition (Table 2).

Item analysis and factorial structure of the Caregiver Preparedness Scale

Table 3 summarizes descriptive statistics for each item of the CPS. All items were normally distributed and there was no excessive skewness or kurtosis. On average, the total score of the CPS was 15.42 (SD = 6.6).

We implemented CFA to test a one-factor model, as reported in the literature.^{25–27} The initial model showed an adequate fit to data in all fit indices with the exception of the results from chi-square and RMSEA. Fit indices were listed as follows: $\chi^2(20, N = 156) = 58.5, p < 0.001$; RMSEA = 0.11 (90% CI 0.08–0.14), $p < 0.01$; CFI = 0.96; TLI = 0.95; and SRMR = 0.033. Further examination of the Modification Indices revealed that the partial misfit was mainly caused by excessive covariance between Items 1 and 2. These two items refer to self-assessment of caregiver's capability to care for the physical (Item 1) and emotional (Item 2) needs of the patient. Although much variance in these two items was explained by the latent dimension of the CPS (as evidenced by

Table 1
Caregiver socio-demographic characteristics (N = 156).

Characteristics	n	%
Age (mean, SD)	53.8	13.2
Gender		
Male	55	35.3
Female	101	64.7
Marital status		
Married	122	78.2
Widowed	4	2.6
Single	20	12.8
Separate	10	6.4
Education		
Elementary school	25	16.0
Middle school	48	30.8
Professional school	20	12.8
High school	40	25.6
University degree	23	14.7
Relationship with patient		
Son/daughter	74	47.4
Spouse	65	41.7
Brother/sister	6	3.8
Friend	3	1.9
Grandson	4	2.6
Son/daughter in law	4	2.6
Living with patient	90	57.7

Table 2
Stroke survivor socio-demographic characteristics and comorbidities (N = 156).

Characteristics	n	%
Age (mean, SD)	69.7	11.6
Gender		
Male	77	49.4
Female	79	50.6
Marital status		
Married	94	60.3
Widowed	45	28.8
Single	12	7.7
Separate	5	3.2
Education		
Elementary school	66	42.3
Middle school	34	21.8
Professional school	10	6.4
High school	35	22.4
University degree	11	7.1
Type of stroke		
Ischemic	124	79.5
Hemorrhagic	26	16.7
Micro-infarct	6	3.8
Stroke side		
Right hemisphere	75	48.1
Left hemisphere	70	44.9
Widespread	11	7.1
Comorbidities		
Hypertension	108	69.2
Hypercholesterolemia	49	31.4
Diabetes	52	33.3
Atrial fibrillation	23	14.7
Myocardial infarctions	15	9.6
Periphery vascular disease	15	9.6
Thyroid disease	15	9.6
Congestive heart failure	13	8.3
COPD	10	6.4
Other comorbidities	11	7.1

Patients could suffer more than one condition; COPD = chronic obstructive pulmonary disease.

high loadings of these two items above 0.70), this covariance was thought to be partially due to the specific domain of caring for the needs of stroke survivors. To account for this excess of covariance in the model, we respecified the model by allowing residuals of Items

Table 3
Item descriptive statistics for the CPS.

	Mean	SD	Skewness	Kurtosis
1. How well prepared do you think you are to take care of your family member's physical needs?	2.01	0.940	0.065	-0.319
2. How well prepared do you think you are to take care of his or her emotional needs?	2.07	0.994	0.042	-0.562
3. How well prepared do you think you are to find out about and set up services for him or her?	1.99	0.984	0.220	-0.593
4. How well prepared do you think you are for the stress of caregiving?	1.85	0.935	0.342	-0.274
5. How well prepared do you think you are to make caregiving activities pleasant for both you and your family member?	1.83	1.001	0.275	-0.151
6. How well prepared do you think you are to respond to and handle emergencies that involve him or her?	1.69	1.060	0.338	-0.617
7. How well prepared do you think you are to get the help and information you need from the health care system?	1.98	0.962	0.037	-0.510
8. Overall, how well prepared do you think you are to care for your family member?	2.00	0.920	-0.048	-0.232

1 and 2 to freely correlate. The respecified model fit the data well with the following fit indices: $\chi^2(19, N = 156) = 35.9, p < 0.01$; RMSEA = 0.074 (90% CI 0.03–0.11), $p = 0.14$; CFI = 0.98; TLI = 0.98; and SRMR = 0.024 (Fig. 1). Loadings for the CPS ranged from 0.742 to 0.899 and were statistically significant. Average variance extracted from the CFA was 65%, which was higher than the level of 50% recommended by Fornell and Larcker.^{45,46}

Another criterion that can be used to suggest the presence of a unique dimension is related to the magnitude of the “residual correlation” (i.e., the portion of the correlation among items that is not explained by common factors)⁴⁷; if these residual correlations are lower than |0.1|, then the entire substantial correlation among items is explained by the common factors, whereas non-explained variance is marginal. In our case, all residual correlations were lower than |0.1|, supporting the conclusion that the one factor model explained the variance shared by the items, and that there was no more common variance to be accounted for beyond what was explained by this single factor. These findings thus support the factorial validity of the CPS.

Reliability analysis

Each item contributed to the scale fairly well and all coefficients of item reliability index and item total correlation (r_{jx}) were higher than the recommended level of 0.30 (Table 4). The composite reliability index was 0.93 and Cronbach's alpha was 0.94. Eliminating any item did not improve the reliability of the scale. The factor score determinacy coefficient was equal to 0.97, which further supports the high internal consistency of the scale. Test-retest reliability at 2 weeks was supported by an ICC of 0.92 (95% CI 0.89–0.94, $p < 0.001$).

Discussion

The aim of this study was to test the psychometric properties of the CPS in caregivers of stroke survivors. The results from our study showed that construct validity and reliability of the CPS were excellent in this population. CFA supported the unidimensionality of the scale found in other caregiver populations.^{25,27} CFA showed that loadings of the latent variable in each item were above the recommended value of 0.30. These findings indicated that the latent variable has a high impact on items. Although covariance between residuals of Item 1 (measuring preparedness to take care of a patient's physical needs) and Item 2 (measuring preparedness to take care of a patient's emotional needs) was allowed to correlate, this correlation was weaker than the effect of the latent variable on the same items (0.38 vs. 0.75 for Item 1 and 0.38 vs. 0.74 for Item 2). As recommended by Fornell⁴⁹ and Bagozzi,⁵⁰ it is reasonable to let residuals correlate with each other when their

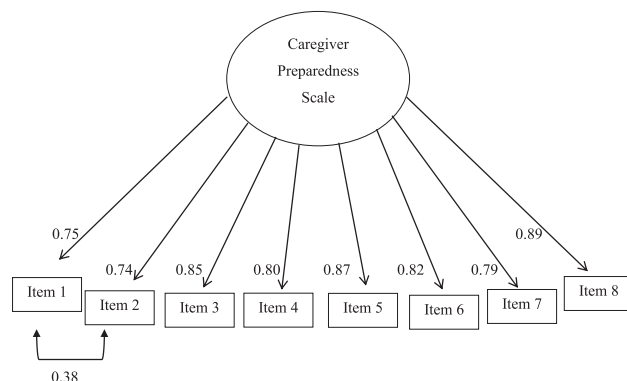


Fig. 1. Confirmative factor analysis of the CPS.

Table 4
Reliability of the CPS.

	IRI	r_{jx}	$\alpha-x$
Item 1	0.57	0.755	0.938
Item 2	0.55	0.743	0.939
Item 3	0.72	0.832	0.932
Item 4	0.65	0.772	0.936
Item 5	0.76	0.838	0.932
Item 6	0.69	0.795	0.935
Item 7	0.63	0.749	0.938
Item 8	0.81	0.870	0.930

IRI = Item Reliability Index; r_{jx} = Item-total correlation; $\alpha-x$ = Cronbach's alpha without the item.

specification does not alter the other parameters in the model and there is theoretical or methodological rationale. The strong correlation between Item 1 and Item 2 ($r = 0.73$; $p < 0.001$) may indicate that preparedness to satisfy patient's physical and emotional needs were consistent in this sample; This means that caregivers who perceived higher preparedness to satisfy patient's physical needs also perceived higher preparedness to satisfy emotional needs and vice versa.

We used traditional as well as innovative methods to analyze reliability of the CPS such as the item and composite reliability indicators recommended by Fornell and Larcker^{45–47} and the factor score determinacy coefficient. Although traditional Cronbach's alpha is a more commonly used index to assess internal coherence, it has been shown to underestimate true reliability value.⁵¹ Moreover, Cronbach's alpha does not reflect the scale's factorial structure underlying correlations between items. Item and composite reliability indices have the advantage of giving estimates of reliability coherent with the factor solutions tested with confirmatory and exploratory approaches. Overall, traditional and alternative measures of internal coherence converged to demonstrate a high level of reliability for the 8-item CPS. However, because this study was conducted only in a group of Italian participants, the psychometric properties of the CPS may vary in other populations.

Our findings demonstrated that the CPS has strong psychometric support to measure caregiver preparedness for caregiving of stroke survivors. Using the CPS may help health-care providers identify family members with less caregiver preparedness and assess specific areas where interventions are needed. Additional support for family members with less caregiver preparedness may help family members enhance caregiver preparedness and adjust their caregiver role. Ostwald et al (2009) reported that preparedness for caregiving is a predictor of stress in caregivers of stroke survivors. Better caregiver preparedness in the early period after stroke may reduce caregiver stress and decrease subsequent stress-related morbidity in this population.

The CPS does not have a specific theoretical underpinning. In fact, when Archbold et al²⁵ developed this scale, their main focus was on caregiver role strain, and caregiver preparedness was considered only an antecedent of responses to family care in a broader theoretical framework based on the role theory.⁵² We were not able to find a specific theory or conceptual framework on preparedness in the literature. Ziembra⁵³ attempted to conceptualize caregiver preparedness, hypothesizing that caregiver preparedness was composed of the following dimensions: knowledge, ability, commitment, and affinity for caregiving. However, when computing factor analysis on data from 117 adult daughter caregivers to older parents, Ziembra found that caregiver preparedness was composed of only three dimensions: ability, knowledge, and commitment. Clearly, a conceptualization of caregiver preparedness is scarce in the literature; the dimensions identified by Ziembra⁵³ may be a starting point to build a more articulated

theoretical framework. Because researchers have shown that caregiver preparedness greatly impacts patient and caregiver outcomes, the development of a theory on preparedness may help in the development of the science in this field.

Limitations of this study include a cross-sectional design, convenience sampling, and a relatively homogeneous sample selection with only Italians. A longitudinal study, with diverse racial/ethnic groups, is required to assess how preparedness of caregiving would change over time. However, because sensitivity to change of the CPS was not tested, this instrument characteristics should be evaluated before drawing conclusion on caregiver preparedness measured over time.

Considering sampling issues, one may question if a sample of 156 participants is sufficient to carry a CFA. Established guidelines⁵⁴ indicate that 5 or 10 to 20 participants per estimated parameter would be sufficient to conduct a CFA. If the variables are highly reliable and correlated, the effects are strong, and the model is not overly complex, smaller samples would be adequate.^{55,56} In other words, CFA models can perform well, even with small samples.⁵⁷ In our study there are a small number of observed variables ($n = 8$), a fairly simple model positing one single factor, a small number of parameters (7 factor loadings, 8 residual variances, 1 residual covariance, 1 factor variance), very high correlations among observed variables (ranging from 0.54 to 0.77, with a mean of 0.68 and a standard deviation of 0.06), and reliability estimates far above 0.90. Thus, we believe that our sample size of 156 participants meets the requirement needed for stable results.

Another limitation is that the CPS was not developed based on a theoretical underpinning for stroke-caregiver preparedness. Thus, our CFA was based on the factorial structure of prior psychometric work performed in other populations. Although prior studies showed that the CPS items reflect stroke-caregiver preparedness,^{25–27} and contrasting group validity of the CPS in this population is supported,⁵⁸ additional studies may be required for further validity testing. Given that some stroke survivors have physical and psychological disability, more dimensions or specific items may be needed to construct a model of preparedness in caregivers of stroke survivors.

Strengths include both traditional and innovative methods used for reliability analysis of the CPS in the study. Moreover, to the best of our knowledge, this is the first study to investigate the psychometric properties of the CPS in caregivers of stroke survivors; thus, we were able to illuminate a previously unexplored area.

Conclusion

All health care systems confront large economic expenditures and more and more health care for patients is moving toward home care rather than hospital care; thus, informal caregivers play an important role in providing care to patients with complex conditions.⁵⁹ Caregiving, however, can be stressful to family members, especially when they are uncertain about their caregiver role or appropriate support, or information is not provided to them, as has been shown in caregivers of stroke survivors.^{32,60} The CPS has shown excellent validity and reliability in a sample of Italian caregivers of stroke survivors. The CPS is highly recommended for clinicians to assess a new caregiver's perception of how prepared they feel for taking on this important role.

Acknowledgments

This study was funded by the Center of Excellence for Nursing Scholarship, Rome, Italy.

Dr. Eeseung Byun is currently supported by a training grant from the National Institutes of Health National Institute of Nursing

Research (T32NR007088). We thank Dr. Kathryn Lee, Department of Family Health Care Nursing, UCSF School of Nursing, for contributing her time to read and comment on the final draft.

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