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The Influence of Caregiver Preparedness on Caregiver Contributions to Self-care in Heart Failure and the Mediating Role of Caregiver

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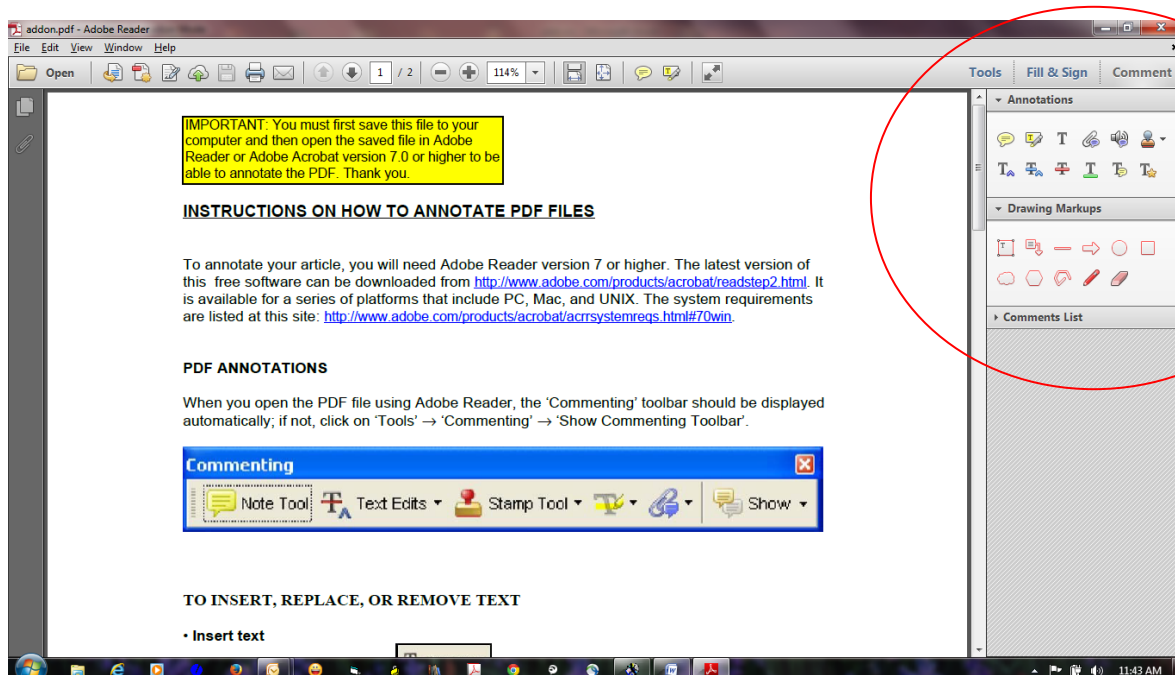
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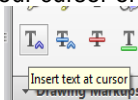
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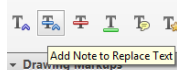
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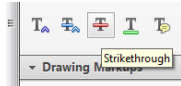
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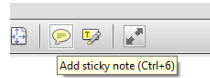
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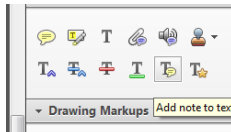
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The Influence of Caregiver Preparedness on Caregiver Contributions to Self-care in Heart Failure and the Mediating Role of Caregiver Confidence

AQ2 Ercole Vellone, PhD, RN, FESC; Valentina Biagioli, PhD, RN; Angela Durante, PhD, RN; Harleah G. Buck, PhD, RN, FPCN, FAAN; Paolo Iovino, MSN, RN; Marco Tomietto, PhD, RN; Sofia Colaceci, PhD; Rosaria Alvaro, MSN, RN, FESC; Antonio Petruzzo, PhD, RN

Background: Caregiver contributions (CC) to heart failure (HF) self-care maintenance (ie, CC to maintaining HF stability) and management (ie, CC to dealing with HF signs and symptoms) improve patient outcomes, but it is unknown whether caregiver preparedness influences CC to self-care and whether caregiver confidence mediates this process. **Objectives:** We evaluated the influence of caregiver preparedness on CC to HF self-care maintenance and management and the mediating role of caregiver confidence. **Methods:** This is a secondary analysis of the MOTIVATE-HF study. Patients were 18 years or older, with a diagnosis of HF in New York Heart Association classes II to IV, who had insufficient self-care and did not have severe cognitive impairment. Patients' informal caregivers were those people inside or outside the family who gave most of the informal care to the patients. We used the Caregiver Preparedness Scale and the Caregiver Contribution to Self-Care of HF Index. We tested a path analysis model and the indirect effects. **Results:** Caregivers (n = 323) were 55 (SD, 15) years old on average and predominantly female (77%). The path analysis showed that higher scores in caregiver preparedness were associated with higher scores in caregiver confidence. In turn, higher caregiver confidence was associated with higher CC to self-care maintenance and management. Caregiver confidence mediated the association between caregiver preparedness and CC to self-care maintenance and management. **Conclusions:** Caregiver confidence may play a role in CC to self-care. Interventions to improve CC to HF self-care not only should be focused on improving caregiver preparedness but also may consider the role of caregiver confidence.

AQ4

KEY WORDS: caregiver preparedness, caregiver confidence, caregivers, heart failure, self-care

AQ5 Heart failure (HF) is a chronic illness with an increasing prevalence due to the aging population and the improved survival rates after myocardial infarction.¹

Heart failure is characterized by high mortality rates, up to 58% 5 years after diagnosis,² and high hospitalization rates, with 44% of patients hospitalized within 12 months after a previous hospitalization.³

Ercole Vellone, PhD, RN, FESC,

Associate Professor, Department of Biomedicine and Prevention, University of Rome "Tor Vergata," Italy.

Valentina Biagioli, PhD, RN,

Research Fellow, Pediatric Hospital "Bambino Gesù," Rome, Italy.

Angela Durante, PhD, RN,

Research Fellow, Department of Biomedicine and Prevention, University of Rome "Tor Vergata," Italy.

Harleah G. Buck, PhD, RN, FPCN, FAAN,

Associate Professor, College of Nursing, University of South Florida, Florida.

Paolo Iovino, MSN, RN,

PhD Student, Department of Biomedicine and Prevention, University of Rome "Tor Vergata," Italy; and Australian Catholic University, Melbourne.

Marco Tomietto, PhD, RN,

Postdoctoral Researcher, Research Unit of Nursing Science and Health Management, University of Oulu, Finland.

Sofia Colaceci, PhD,

Assistant Professor, Saint Camillus International University of Health Sciences, Rome, Italy.

Rosaria Alvaro, MSN, RN, FESC,

Professor, Department of Biomedicine and Prevention, University of Rome "Tor Vergata," Italy.

Antonio Petruzzo, PhD, RN,

San Camillo Hospital, Rome, Italy.

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Correspondence:

Ercole Vellone, PhD, RN, FESC, Department of Biomedicine and Prevention, University of Rome Tor Vergata, Via Montpellier 1, 00133 Rome, Italy (ercole.vellone@uniroma2.it).

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AQ3

Patients can mitigate the poor outcomes associated with HF by adopting adequate self-care,¹ which consists of those behaviors aimed at maintaining the illness' stability—for example, by taking medications as prescribed (self-care maintenance) and responding to signs and symptoms of exacerbation as soon as they appear (self-care management).⁴ However, self-care is not simple, and most patients find it difficult to perform, especially if they are older, are affected by comorbid conditions, and have cognitive impairment and lower self-care confidence.^{5,6}

Given the previously mentioned issues, patients' informal caregivers (eg, patients' family members or friends) play an important role in contributing to HF patient self-care.⁷ Heart failure caregivers give concrete and emotional support to their patients,^{8–10} improve medication adherence, and play a key role in navigating the healthcare system.^{7,8} In addition, caregiver contributions (CC) to HF self-care maintenance can reduce patients' clinical event risks (ie, hospitalizations, use of emergency services, and mortality).¹¹

The Situation-Specific Theory of Caregiver Contributions to Heart Failure Self-Care defines CC to HF self-care as the process by which an informal caregiver recommends or performs for the patients those activities that help the patient to maintain HF stability (CC to self-care maintenance), facilitates the perception of the signs and symptoms of HF (CC to symptom monitoring and perception), and responds to the signs and symptoms of HF decompensation (CC to self-care management).¹² These 3 components of CC to HF self-care are hypothesized to influence each other without a specific sequence.¹² However, they occur in sequence⁴ in patients, and Chen and colleagues¹³ have found that CC to self-care maintenance influence CC to self-care management. In the theory, CC to HF self-care are influenced by several factors at the caregiver, patient, and dyadic levels. Caregiver sociodemographic factors (eg, gender, age, job, caregiving hours, and education) have been theorized as variables influencing CC to self-care, as well as patient sociodemographic and clinical factors (eg, gender, age, education, New York Heart Association class, months of illness, comorbidities, and cognition). In the theory, all these factors can be mediated by caregiver confidence—that is, the caregiver's feeling of being able to contribute effectively to the improvement of HF patient self-care. Caregiver confidence was found to explain most of the variance in CC to HF self-care maintenance and management.¹⁴

A caregiver-level factor that might improve CC to HF self-care is caregiver preparedness, which was defined as the ability to take care of both the physical and emotional needs of the care recipient.¹⁵ Preparedness was shown to improve several caregiver outcomes in dementia and cancer, such as hope, mental quality of life, anxiety, depression, and strain.^{16–20} Although caregiver

preparedness is associated with positive outcomes in caregivers, few studies have been conducted on HF caregiver preparedness. Authors of these studies found that HF caregivers complained about the lack of preparation in caregiving²¹ and that higher caregiver preparedness was associated with lower caregiver depression²² and higher self-gain.²³ Because caregiver preparedness is associated with positive outcomes in other caregiver populations and can be modified with interventions, it is worth investigating whether caregiver preparedness influences CC to HF self-care. Because patients with HF struggle to perform self-care and HF self-care was found to be associated with good outcomes in patients,¹¹ it is worth investigating ways to improve CC to self-care. In the Situation-Specific Theory of CC to HF Self-care, preparedness could be a caregiver-level factor influencing CC to HF self-care through the mediation of caregiver confidence. However, so far, no author has tested this relationship. Therefore, in this study, we hypothesized that (1) caregiver preparedness influences caregiver confidence, (2) caregiver confidence influences CC to self-care maintenance and management, (3) CC to self-care maintenance influence CC to self-care management, and (4) caregiver confidence mediates the relationship between preparedness and CC to self-care maintenance and management (Figure 1).

F1

Methods

Design

This is a secondary analysis from the baseline data of the MOTIVATE-HF study,²⁴ a randomized controlled trial aimed at evaluating the effect of motivational interviewing in improving self-care in patients with HF and caregivers.

Participants

The participants of the MOTIVATE-HF study included patient and caregiver dyads enrolled in several cardiology settings in central and southern Italy. The inclusion/exclusion criteria for patients and caregivers have been published elsewhere.²⁴ Briefly, patients were included in this study if they were 18 years or older, with a diagnosis of HF in New York Heart Association (NYHA) functional classes II to IV; had insufficient self-care

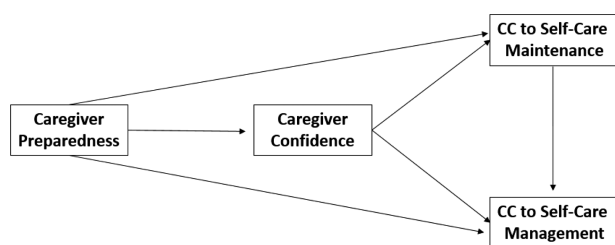


FIGURE 1. Theoretical model guiding the study. CC, caregiver contributions.

(defined as a score of 0, 1, or 2 in at least 2 items of the self-care maintenance or self-care management scales of the Self-Care Heart Failure Index v.6.2 [SCHFI v.6.2])^{25,26}; were willing to participate in the study and sign the informed consent form; and did not have severe cognitive impairment, defined as a score of 0 to 4 on the six-item screener.²⁷ We also enrolled patients' informal caregivers in the study, defined as those people inside or outside the family who gave most of the informal care to the patients.

Data Collection

Data were collected by research assistants who were all nurses trained in the study protocol. These research assistants recruited caregivers and patients in the described settings. All participants, after signing the informed consent form, completed the MOTIVATE-HF study instrument battery, including instruments for patients (the Self-Care of HF Index,^{25,26} HF Somatic Perception Scale,^{28,29} Kansas City Cardiomyopathy Questionnaire,³⁰ and Montreal Cognitive Assessment [MoCA]³¹), instruments for caregivers (the Caregiver Contribution to Self-Care of HF Index [CC-SCHFI],⁹ Caregiver Preparedness Scale,³² and Multidimensional Scale of Perceived Social Support³³), and instruments for both (the Short Form 12,³⁴ Hospital Anxiety and Depression Scale,³⁵ Pittsburgh Sleep Quality Index,³⁶ and Mutuality Scale³⁷). However, for the purposes of this study, we considered the measures discussed hereinafter.

The Caregiver Preparedness Scale (CPS)¹⁵ is an instrument evaluating the preparedness of caregivers who assist patients with chronic conditions. It is an 8-item instrument that uses a 5-point Likert scale for responses ranging from 0 ("not at all prepared") to 4 ("very well prepared"). Items of the CPS investigate the extent to which a caregiver feels prepared to take care of both the physical and emotional needs of a patient. The total score ranges from 0 to 4, with a higher score meaning higher preparedness. The validity and reliability of the CPS have been tested in caregivers of patients with HF, showing supportive fit indices at confirmatory factor analysis (eg, Comparative Fit Index [CFI], 0.97; root mean square error of approximation [RMSEA], 0.065) and supportive reliability (Cronbach $\alpha = .91$).³⁸

The CC-SCHFI⁹ is a 22-item instrument that measures the contributions of an informal caregiver to patient HF self-care. It is divided into 3 separate scales measuring CC to self-care maintenance (eg, recommending the patient assess their ankles for swelling), CC to self-care management (eg, helping the patient to identify signs or symptoms of exacerbations), and caregiver confidence (eg, confidence in helping the patient to perform self-care). The CC to self-care management scale can be administered only when caregivers have reported their patients to have had symptoms in the last month. In this version

of the CC-SCHFI, which was developed before the Situation-Specific Theory of HF Caregiver Contributions to HF Self-Care,¹² the self-care monitoring dimension is embedded in the self-care maintenance scale. The CC-SCHFI uses a 4-point Likert scale for responses, with a total standardized score from 0 to 100 for each scale. A higher score in each scale indicates a better contribution to patient self-care. The 3 CC-SCHFI scales were each tested for validity and reliability and showed supportive fit indices at confirmatory factorial analysis (CFI from 0.96 to 0.99, RMSEA from 0.03 to 0.06) and at the factor score determinacy coefficient (ranging from 0.65 to 0.84), which measures reliability.⁹

Because, in the theory guiding the study, CC to HF self-care are influenced by several caregiver and patient factors, we considered the following sociodemographic variables in caregivers: gender, age, job, caregiving hours, and education; in patients, we considered the following sociodemographic and clinical variables: gender, age, education, NYHA class, months of illness, comorbidities, and cognition. To evaluate patient comorbidities and cognition, we used the Charlson Comorbidity Index (CCI) and the MoCA, respectively. The CCI³⁹ is used extensively, including in patients with HF, to assess comorbidities. Each of the 19 comorbidities in the CCI have a possible score from 1 (eg, HF) to 6 (eg, cancer with metastasis), with a total score between 1 and 36. A higher score means worse comorbid conditions. The validity of the CCI was demonstrated by its ability to predict 10-year mortality.³⁹ The MoCA³¹ is a 30-item screening instrument for evaluating cognitive function by considering 7 cognitive domains: visuospatial/executive, naming, attention, language, abstraction, delayed recall, and orientation. The MoCA was tested for concurrent validity with the Mini Mental State Examination and test-retest and internal consistency reliability (Cronbach $\alpha = .83$).³¹ The possible score ranges between 0 and 30, with a higher score indicating better cognition.

Ethical Considerations

The study was approved by the institutional review board of the University of Rome Tor Vergata (letter n. 121/13). Caregivers and patients were fully informed about the aims of the study, had to sign the informed consent form, and were informed that they could leave the study at any moment. In addition, caregivers and patients were assured that all collected data would be kept confidential.

Data Analysis

Descriptive statistics (mean, SD, frequencies, and percentages) were used to describe caregivers' sociodemographic characteristics and patients' sociodemographic and clinical characteristics. The scores of the CPS and CC-SCHFI were calculated as mean and SD. The scores

of the CPS and CC-SCHF were also evaluated for skewness and kurtosis to evaluate the normality of the data. Correlations among the studied variables were computed using Pearson or Spearman correlations as appropriate.

To test the first 3 hypotheses guiding the study, we implemented a model of path analysis,⁴⁰ as illustrated in Figure 1. Because the hypotheses to be tested implied the use of the scores of the CC to self-care management scale, our statistical analysis considered only those caregivers ($n = 323$) who reported that their patients had HF symptoms during the last month. A preliminary check of missing data on these 323 caregivers showed that 96.9% of this subsample had no missing data and the remaining 3.1% had only 1 variable missing. The Little test,⁴¹ which was used to evaluate whether missing data were missing completely at random, resulted to be not significant ($P = .234$). Consequently, the data were considered missing completely at random,⁴² and the full information maximum likelihood estimation in Mplus was selected to conduct the path analysis model.

The scores of the CPS, CC to self-care maintenance and management, and caregiver confidence were normally distributed; consequently, we chose the maximum likelihood estimator to test the model.⁴³ The model fit was evaluated using the following indices: the CFI and Tucker-Lewis Index, with values greater than 0.95 indicating an excellent fit; the standardized root mean square residual, with values of 0.08 or less indicating a good fit; and the RMSEA, with values less than 0.06 indicating a good fit.⁴⁴ χ^2 Statistics were also reported.⁴³ In the path analysis, we also included the variables that were found to be significantly correlated with the CPS, CC to self-care maintenance and management, and caregiver confidence (covariates).

To test the fourth hypothesis, whether caregiver confidence mediates between caregiver preparedness and CC to self-care maintenance and management, we tested the indirect effects through caregiver confidence, from the CPS scores to CC to self-care maintenance scores and from the CPS scores to CC to self-care management scores. We performed this mediation analysis by estimating the indirect effects with a bootstrapping method, using 5000 replications of the original sample.⁴⁵ P values less than .05 were considered statistically significant. Statistical analyses were conducted using IBM SPSS version 22 and Mplus version 7 (Muthén and Muthén, Los Angeles, California).

Results

Participants' Characteristics

A total sample of 494 caregiver-and-patient dyads was available for data analysis, but only 323 caregivers (65.4%) reported that their patients had HF symptoms in the last month and could complete the self-care

management scale of the CC-SCHF. Caregivers considered in the present analysis were not different in terms of age ($P = .165$), gender ($P = .179$), and CPS ($P = .465$), CC to self-care maintenance ($P = .507$), and caregiver confidence ($P = .279$) scores compared with those who were excluded for the previously mentioned reasons, but they cared for patients with HF who were older (mean [SD], 74.46 [11.06] vs 68.29 [13.52]; $P < .001$) and more frequently female (45.8% vs 33.9%; $P = .011$). In addition, caregivers included in our analysis cared for patients who were more often in NYHA classes III to IV than those who were excluded (50.5% vs 14.7%; $P < .001$), but they cared for patients who were comparable in terms of CCI scores ($P = .208$) in reference to patients excluded from the analysis.

Table 1 shows the sociodemographic characteristics of caregivers. These caregivers were 54.63 (SD, 15.16) years old on average and were mainly female (77.4%). Most of them had a partner (71.2%), were unemployed (52.1%), and were educated at the high school level or lower (79.4%). Caregivers were most often the patient's child (42.7%) or spouse (33.5%) and lived with the patient (61.3%). They had been caring for their patients for more than 9 hours per day.

Patients were 74.46 (SD, 11.06) years old on average and mainly male (54.2%) (Table 1). Most of them had

TABLE 1 Sociodemographic Characteristics of Caregivers (N = 323) and Their Patients (N = 323)

	Caregivers n (%)	Patients n (%)
Age, mean (SD), y	54.63 (15.16)	74.46 (11.06)
Gender		
Male	73 (22.6)	175 (54.2)
Female	250 (77.4)	148 (45.8)
Marital status		
With partner	225 (71.2)	192 (59.4)
Without partner	91 (28.8)	131 (40.6)
Job		
Employed	151 (47.9)	41 (12.7)
Unemployed/retired	164 (52.1)	281 (87.3)
Education		
Lower than high school	117 (36.4)	218 (67.5)
High school	138 (43.0)	79 (24.5)
University degree	66 (20.6)	26 (8.0)
Relationship with patient		
Spouse	106 (33.5)	—
Child	135 (42.7)	—
Other	75 (23.7)	—
Caregiver living with patient	193 (61.3)	—
Mean (SD)		
Caregiving hours per day	9.93 (8.73)	—
Scores		
CPS	2.11 (0.76)	—
CC to self-care maintenance	51.78 (18.27)	—
CC to self-care management	51.18 (20.56)	—
Caregiver confidence	57.24 (22.47)	—

Abbreviations: CC, caregiver contributions; CPS, Caregiver Preparedness Scale.

a partner (59.4%), were retired (87.3%), and were educated at less than a high school level (67.5%). Table 2 shows the clinical characteristics of the patients. Patients had a median illness duration of 3 years and were mainly in NYHA class II (49.5%), with a CCI mean (SD) score of 3.12 (2.08). The most common comorbidities were hypertension (73.4%), diabetes (40.2%), and atrial fibrillation (33.9%). The patients' mean (SD) score on the MoCA was 22.48 (6.10), indicating mild cognitive impairment.

Scales' Scores and Correlation Analysis

Caregivers reported a moderate level of preparedness at CPS (mean [SD], 2.11 [0.76]). The scores of the CC to self-care maintenance and management and caregiver confidence were 51.78, 51.18, and 57.24, respectively (Table 1). As illustrated in Table 3, CPS scores were significantly correlated with CC to self-care maintenance and management and caregiver confidence; CC to self-care maintenance scores were significantly correlated with patient age, education, CCI scores, MoCA scores, and CPS scores; CC to self-care management scores were significantly correlated with patient age, patient months

of illness, caregiver job, caregiver education, CPS scores, and CC to self-care maintenance; and caregiver confidence was correlated with patient months of illness, CCI scores, caregiver job, caregiver education, CPS scores, and CC to self-care maintenance and management (Table 3).

Model Testing

Figure 2 shows the tested path analysis model that resulted with the following excellent fit indices: $\chi^2 = 4.29$ (9), $P = .89$; CFI, 1.00; Tucker-Lewis Index, 1.03; and RMSEA, 0.00 (90% confidence interval, 0.00–0.03); standardized root mean square residual, 0.01. In line with our hypotheses, higher CPS scores were associated with higher self-care confidence scores and higher CC to self-care maintenance scores, higher caregiver confidence scores were associated with higher CC to self-care maintenance and management scores, and higher CC to self-care maintenance scores were associated with higher CC to self-care management scores. The tested model also showed significant relationships with the covariates that were specified in the model because of significant correlations with CC to self-care maintenance and management and caregiver confidence. Caregiver contributions to self-care maintenance were significantly influenced by CCI scores, CC to self-care management were significantly associated with months of illness, and, finally, caregiver confidence was significantly influenced by caregiver education and months of illness. All tested models explained 44% of the variance in caregiver confidence, 22% of the variance in CC to self-care maintenance, and 42% of the variance in CC to self-care management.

Mediation Analysis

The mediation analysis is reported in Table 4. The total indirect effect of CPS to CC to self-care maintenance through caregiver confidence was positive and significant. This is evidence of a mediation of caregiver confidence between CPS and CC to self-care maintenance. The total indirect effect from CPS to CC to self-care management through caregiver confidence and CC to self-care maintenance was positive and significant as well. However, looking at the specific indirect effects, the only significant indirect effect was the one between CPS and CC to self-care management through caregiver confidence. The effect of CPS on CC to self-care management through CC to self-care maintenance and the effect of CPS through caregiver confidence and CC to self-care maintenance were not statistically significant. This is evidence of a mediation of caregiver confidence between CPS and CC to self-care management and that, despite CC to self-care maintenance influencing CC to self-care management, CC to self-care maintenance do

TABLE 2 Clinical Characteristics of Patients (N = 323)

	n (%)
Ejection fraction, mean (SD)	43.09 (9.70)
Months of illness, mean (SD)	66.68 (76.80)
NYHA class	
II	160 (49.5)
III	134 (41.5)
IV	29 (9.0)
Etiology of HF	
Ischemic	107 (33.5)
Not ischemic	79 (24.8)
Idiopathic	85 (26.6)
Other	48 (15.0)
Comorbidities ^a	
Hypertension	237 (73.4)
Diabetes mellitus	130 (40.2)
Atrial fibrillation	109 (33.9)
Peripheral vascular disease	101 (31.3)
COPD	94 (29.1)
Anemia	48 (14.9)
Renal disease	40 (12.4)
Cancer	25 (7.7)
Pulmonary hypertension	21 (6.5)
CCI score	
1	66 (21.0)
2–3	150 (47.6)
4–5	64 (20.3)
≥ 6	35 (11.1)
MoCA score, mean (SD)	22.48 (6.10)

Abbreviations: COPD, chronic obstructive pulmonary disease; CCI, Charlson Comorbidity Index; MoCA, Montreal Cognitive Assessment; NYHA, New York Heart Association.

^aPatients could be affected by more comorbidities.

TABLE 3 Correlations Among the Study Variables (N = 323)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Patient characteristics															
1. Gender (female)	1														
2. Age	0.170 ^a	1													
3. Education	-0.316 ^a	-0.463 ^a	1												
4. NYHA class	0.035	0.232 ^a	-0.128 ^b	1											
5. Months of illness	0.036	0.114 ^b	-0.126 ^b	0.073	1										
6. CCI score	-0.094	0.129 ^b	-0.197 ^a	0.250 ^a	0.159 ^a	1									
7. MoCA score	0.088	-0.343 ^a	0.380 ^a	-0.234 ^a	0.093	-0.134 ^b	1								
Caregiver characteristics															
8. Gender (female)	-0.216 ^a	0.067	0.005	-0.033	-0.020	0.137 ^b	-0.005	1							
9. Age	-0.280 ^a	0.232 ^a	0.027	0.104	-0.045	0.059	-0.041	0.056	1						
10. Job (employed)	0.198 ^a	0.050	-0.103	0.024	0.005	-0.021	-0.072	-0.174 ^b	-0.531 ^a	1					
11. Caregiving hours	-0.230 ^a	0.097	0.037	0.150 ^a	-0.018	0.024	-0.136 ^b	0.074	0.505 ^a	-0.384 ^a	1				
12. Education	0.093	0.066	0.199 ^a	-0.064	0.023	-0.024	0.055	-0.086	-0.375 ^a	0.368 ^a	-0.273 ^a	1			
13. CPS score	-0.041	0.091	0.045	-0.019	0.024	0.103	0.055	0.093	0.029	0.020	0.058	0.058	1		
14. CC to self-care maintenance	0.017	0.203 ^a	-0.110 ^b	0.089	0.080	0.209 ^a	-0.155 ^a	0.032	0.025	0.032	0.086	0.080	0.360 ^a	1	
15. CC to self-care management	-0.100	0.118 ^b	0.003	0.036	0.176 ^a	0.063	-0.015	-0.028	-0.082	0.183 ^a	-0.023	0.214 ^a	0.410 ^a	0.426 ^a	1
16. Caregiver confidence	-0.029	0.100	0.027	-0.036	0.153 ^a	0.121 ^b	0.052	0.046	-0.066	0.129 ^b	0.037	0.166 ^a	0.605 ^a	0.443 ^a	0.611 ^a

Spearman correlation coefficients are in italics.

Abbreviations: CC, caregiver contributions; CCI, Charlson Comorbidity Index; CPS, Caregiver Preparedness Scale; MoCA, Montreal Cognitive Assessment; NYHA, New York Heart Association.

^aP < .01.

^bP < .05.

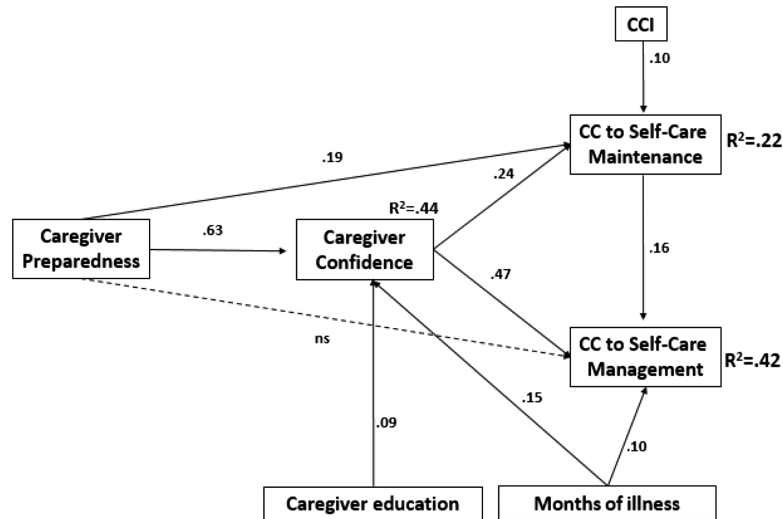


FIGURE 2. The tested model at path analysis. The following paths were also tested in the model that resulted to be not significant: patient age, patient education, Montreal Cognitive Assessment score → CC to self-care maintenance; patient age, caregiver education, caregiver job → CC to self-care management; caregiver job, CCI score → caregiver confidence. CC, caregiver contributions; CCI, Charlson Comorbidity Index; ns, nonsignificant.

not mediate between CPS, caregiver confidence, and CC to self-care management.

Discussion

In this study, we found that caregiver preparedness influenced CC to HF self-care maintenance and management, and this influence was mediated by caregiver confidence. To our knowledge, this is the first study showing these relationships, and these new findings may have important clinical and theoretical implications.

Previous studies have shown that caregiver preparedness is associated with better caregiver outcomes in other caregivers,⁴⁶ but preparedness has received little attention in HF, despite an earlier qualitative work that we conducted²¹ showing that a lack of preparedness was an issue in this population. What the current study adds is that caregivers who felt more prepared also felt more confident in providing care. In turn, greater confidence was associated with greater self-care contributions. Interestingly, the mediation analysis evidenced that

caregiver preparedness has both a direct and an indirect influence on CC to self-care maintenance but only an indirect influence on CC to self-care management. These findings might suggest that, in the case of CC to self-care maintenance, the more caregivers feel prepared, the more they believe to contribute to patient self-care maintenance both directly and through the effect of increased caregiver confidence. In the case of CC to self-care management, caregiver preparedness might improve CC to self-care management mainly through its positive effect on caregiver confidence.

It has been established over multiple studies that confidence predicts self-care behaviors (maintenance and management) in patients,⁴⁷ caregivers,¹³ and patient/caregiver dyads.⁴⁸ Equally well established is the mediating role of self-care confidence between social support,⁴⁹ cognition,⁵⁰ and comorbidity⁵¹ and patient self-care. However, to our knowledge, authors of only 1 previous study¹³ found that caregiver confidence mediated the relationship between a predictor (HF knowledge, in this case) and CC to HF self-care. Here in our study, we suggest

TABLE 4 Mediation Analysis

	Estimate	95% CI	P
Total effect from CPS to CC to self-care maintenance	0.343	0.231–0.455	<.001
Indirect effect: CPS→caregiver confidence→CC to self-care maintenance	0.153	0.062–0.244	.001
Direct effect: CPS → CC to self-care maintenance	0.190	0.054–0.326	.006
Total effect from CPS to CC to self-care management	0.411	0.316–0.506	<.001
Total indirect effect from CPS to self-care management	0.347	0.260–0.435	<.001
Specific indirect effects			
CPS→CC to self-care maintenance →CC to self-care management	0.030	−0.002 to 0.062	.066
CPS→CC caregiver confidence→CC to self-care management	0.293	0.209–0.377	<.001
CPS→caregiver confidence→CC to self-care maintenance→CC to self-care management	0.024	−0.001 to 0.050	.063
Direct effect: CPS→CC to self-care management	0.064	−0.052 to 0.180	.282

Abbreviations: CC, caregiver contributions; CI, confidence interval; CPS, Caregiver Preparedness Scale.

that caregiver confidence mediates the relationship between preparedness and CC to self-care, suggesting that improving caregivers' preparedness, for example, through targeted education, could actually improve their behaviors in maintaining stable HF and dealing with symptoms also because it might create a feeling of confidence in contributing to patient self-care in caregivers. This finding is also meaningful from a motivational perspective, as caregiver preparedness is mainly cognitive, based on the caregiver's knowledge and skills regarding managing the patient with HF, whereas caregiver confidence is based on the caregiver's feelings about being able to manage the patient with HF. In this way, our findings indicate that knowledge and skills are not enough to foster confidence. Further research should deepen the motivational factors to promote confidence in caregivers and to empower them to care for patients with HF. However, although we found that caregiver confidence was a mediator between caregiver preparedness and CC to HF self-care, as argued by Hayes and Rockwood,⁵² other variables could also affect the relationship between caregiver preparedness and CC to self-care. Thus, further research is needed.

In the path analysis model that we tested, CC to self-care maintenance had a significant and direct effect on CC to self-care management. When we developed the Situation-Specific Theory of CC to HF Self-care, we hypothesized a relationship between the previously mentioned 2 dimensions, but we did not know in which direction. In this study, considering the self-care theories^{4,53} and the empirical evidence,^{13,54} we specified and found that CC to self-care maintenance influenced CC to self-care management. This result strengthens the evidence that, for caregivers, as for patients,⁴ activities related to the maintenance of HF stability precede activities to deal with HF symptoms. However, considering the cross-sectional nature of our data, this finding should be considered with caution. Further longitudinal studies are needed to better investigate whether CC to self-care maintenance influence CC to self-care management.

With all the limitations given by the cross-sectional nature of our data and the possible confounding of covariates with one another, our analysis showed interesting relationships with the covariates of the tested model. We found that CC to self-care maintenance were higher when the patient had more comorbidities. To our knowledge, this is the first study showing this relationship. This could be explained by the fact that more comorbidities in the patient could stimulate the caregiver to give more recommendations to the patient, because he or she experiences more conditions requiring attention. In addition, we found that better CC to self-care management were associated with more months of illness. There is no other evidence on this relationship in the literature, and our interpretation is that more months of illness could create more skills in caregivers on how to

deal with patient symptoms. Finally, we found that caregiver confidence was better if caregivers were better educated and cared for patients affected by HF for more months. No authors of previous studies of HF have found a relationship between caregiver confidence and caregiver education, but authors of previous studies performed in other caregiver populations found that caregiver education influenced caregiver confidence.^{55,56} It could be that patients who have had HF for a longer duration have created, in the caregivers, a feeling of being more able to manage the self-care process.

This study has important clinical, theoretical, and research implications. The clinical implication is that, if we improve the preparedness and confidence of HF caregivers, they could contribute more effectively to HF self-care. Research on the outcomes of CC to HF self-care is still scarce,⁵⁷ but in a previous study that we conducted, we showed that higher CC to self-care maintenance were a predictor of fewer patient clinical events (ie, hospitalizations, use of emergency services, and death).¹¹ However, in the same study, we showed that higher CC to self-care management were associated with more clinical events, maybe because caregivers with higher scores in CC to self-care management deal with symptomatic patients who have worse conditions. More research is needed in this area, as CC to HF self-care seem not to be burdensome for caregivers,⁵⁸ and the Situation-Specific Theory of CC to HF Self-care can drive future research.

Another important implication of this study is in terms of theory development. In this study, we identified for the first time another caregiver-level factor influencing CC to HF self-care (ie, preparedness) and, for the second time, that caregiver confidence is a mediator in the process and that CC to self-care maintenance influence CC to self-care management. In terms of future research, through this study, we could inform future interventions aimed at improving CC to HF self-care. Because CC to HF self-care have great importance—especially when the patient is unable to care for himself or herself—it is important to improve caregiver preparedness. However, in this study, we have also given evidence that caregiver preparedness could be useless if not associated with an intervention aimed at improving caregiver confidence.

This study has several limitations. First, we used cross-sectional data that limit the causality among the variables and preclude the assessment of the temporal precedence that is implied by mediation. Second, we performed a secondary analysis with data collected on a convenience sample that was enrolled only in Italy. Third, because the CC to self-care management scale can be completed only if the caregiver reports that the patient had symptoms during the last month, our findings should be generalized with caution to caregivers reporting that their patients had no symptoms. Fourth,

What's New and Important?

- Informal caregivers of patients with HF who are more prepared to take care of their patients could be more confident to contribute to the self-care of patients with HF.
- Informal caregivers of patients with HF who have better confidence could contribute more to HF patient self-care maintenance (to maintain HF stability) and self-care management (to manage HF signs and symptoms of decompensation).
- Interventions to improve CC to HF self-care could be more effective if they improve also caregiver confidence.

acquiescence response bias due to all positively worded items could have contributed to inflate correlations. Finally, in accordance with the MOTIVATE-HF research protocol, we enrolled only patients in NYHA classes II to IV. Consequently, generalization of our findings should be done with caution on patients in NYHA class I.

Conclusion

In conclusion, the initial hypotheses of our study were confirmed. Caregiver confidence may play a key role in CC self-care, as we found that it mediates the relationship between caregiver preparedness and CC to HF self-care maintenance and management. This new knowledge has important clinical, scientific, and theoretical implications in shaping the future of HF patient self-care and in supporting caregivers. Because caregivers have an important role in HF care, further studies on this population are important to safeguard their conditions and improve patient outcomes.

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