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Validity and Reliability of the Caregiver Contribution to Self-Care to Heart Failure Index

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Validity and Reliability of the Caregiver Contribution to Self-Care to Heart Failure Index

Abstract

Background: Caregivers make an important contribution to the self-care of patients with heart failure (HF), but few instruments are available to measure this contribution.

Objective: The objective of this study was to test the psychometric properties of the Caregiver Contribution to Self-care of Heart Failure Index (CC-SCHFI), an instrument derived from the Self-care of Heart Failure Index version 6.2. The CC-SCHFI measures the contribution of caregivers to the self-care maintenance and self-care management of HF patients, as well as their confidence in their ability to contribute to the patients' HF self-care.

Methods: A cross-sectional design was used to study 291 Italian caregivers whose HF patients were cared for in 17 cardiovascular centers across Italy. Caregivers completed the CC-SCHFI and a sociodemographic questionnaire. Caregivers were retested on the CC-SCHFI 2 weeks later to assess test-retest reliability.

Results: Most caregivers were women (66%) with a mean age of 59 years. First- and second-order confirmatory factor analysis (CFA) for each CC-SCHFI scale showed good model fit: $\chi^2 = 37.22$, $P = .08$, Comparative Fit Index (CFI) = 0.97, Non-Normed Fit Index (NNFI) = 0.96 for caregiver contribution to self-care maintenance (second-order CFA); $\chi^2 = 14.05$, $P = .12$, CFI = 0.96, NNFI = 0.93 for caregiver contribution to self-care management (first-order CFA); and $\chi^2 = 10.63$, $P = .15$, CFI = 0.99, NNFI = 0.98 for caregiver confidence in contributing to self-care (second-order CFA). The CC-SCHFI was able to discriminate statistical and clinical differences between 2 groups of caregivers who had received or not received HF self-care education. Internal consistency reliability measured by factor score determinacy was more than .80 for all factors and scales except for 1 factor in the caregiver contribution to self-care management scale (.65). Test-retest reliability computed by intraclass correlation coefficient was high (>0.90) for most factors and scales.

Conclusion: The CC-SCHFI showed good psychometric properties of validity and reliability and can be used to measure the contribution of caregiver to HF patient self-care.

Keywords

caregivers, heart failure, instrument development, psychometrics, self-care, self-management, social support

Disciplines

Behavioral Medicine | Cardiology | Cardiovascular Diseases | Circulatory and Respiratory Physiology | Medical Humanities | Medicine and Health Sciences | Nursing | Preventive Medicine

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Abstract

Background. Caregivers make an important contribution to the self-care of patients with heart failure (HF) but few instruments are available to measure this contribution.

Objective. The objective of this study was to test the psychometric properties of the Caregiver Contribution to Self-Care of Failure Index (CC-SCHFI), an instrument derived from the Self-care of Heart Failure Index v.6.2 (SCHFI v.6.2). The CC-SCHFI measures the contribution of caregivers to the self-care maintenance, self-care management, and self-care confidence of HF patients.

Methods. A cross-sectional design was used to study 291 Italian caregivers whose HF patients were cared for in 17 cardiovascular centers across Italy. Caregivers completed the CC-SCHFI and a sociodemographic questionnaire. Caregivers were retested on the CC-SCHFI two weeks later to assess test-retest reliability.

Results. Most caregivers were female (66%) with a mean age of 59 years. First and second order confirmatory factor analysis (CFA) for each CC-SCHFI scale showed good model fit: Chi-square 37.22, p 0.08, CFI .97, NNFI .96 for self-care maintenance (second order CFA); Chi-square 14.05, p 0.12, CFI .96; NNFI .93 for self-care management (first order CFA); Chi square 10.63, p 0.15, CFI .99, NNFI .98 for self-care confidence (second order CFA). The CC-SCHFI was able to discriminate statistical and clinical differences between two groups of caregivers who had received or not received HF self-care education. Internal consistency reliability measured by factor score determinacy was over .80 for all factors and scales except for one factor in the self-care management scale (.65). Test-retest reliability computed by intraclass correlation coefficient (ICC) was high (above .90) for most factors and scales.

Conclusion. The CC-SCHFI showed good psychometric properties of validity and reliability and can be used to measure the contribution of caregiver to HF patient self-care.

Key words: Heart failure, self-care, self-management, caregivers, social support, instrument development, instrument reliability and validity

Introduction

Heart failure (HF) is extremely common in older adults worldwide. In the U.S. it was estimated that 2.3% of the population or 5,700,000 individuals had HF in 2008 ¹. In Italy, where this study was conducted, 1.1% of the population has HF with an increasing prevalence of 12.1% in people aged 70 and over ².

A diagnosis of HF requires significant amounts of self-care, which patients find difficult to perform ^{3,4}. Caregivers make important contributions to patient self-care ^{5,6}. Yet, there has been surprisingly little research on the contributions by informal caregivers to HF patient self-care. This is probably because the measurement of caregiver contributions is in its infancy. Although measures of social support are commonly available, only one measure of caregiver perceptions of HF patient self-care has been published and it is available only in English ⁵. Further, that instrument was developed as a proxy measure of the patient's self-care rather than the independent contributions made by the caregiver. Thus, the purpose of this study was to describe the psychometric properties of a new scale measuring caregivers' contributions to HF self-care that is based on the Self-care of HF Index version 6.2 (SCHFI v. 6.2)⁷⁻⁹. This scale is referred to as the Caregiver Contributions to the Self-Care of Heart Failure Index (CC-SCHFI).

Self-care of HF has been defined as a naturalistic decision making process used to maintain physiological stability (maintenance) and to manage symptoms when they occur (management).^{8,10} We defined the caregiver's contribution to the HF patient's self-care as the provision of time, effort, and support in the behalf of another person who needs to perform HF self-care. This definition is supported by several studies who demonstrated that caregivers contribute to better self-care maintenance and management in HF. {Gallagher, 2011 #154} {Sebern, 2009 #58} {Sebern, 2011 #155}. In contributing to HF self-care, caregivers adapt

their behaviors to the patient's ability to perform self-care: in some cases they only make recommendation about the practice of self-care maintenance and self-care management (e.g. weigh every day, eat a low-salt diet, take medicines, call the doctor or nurse when symptoms occur). But when patients are unable to practice self-care for whatever reason, caregivers substitute for patients in all the self-care processes, (they weigh the patient, chose and prepare low-salt food, administer medicines , call the doctor/nurse when symptoms occur). Confidence in their contributions is believed to contribute to the success of caregivers in promoting self-care.

Background

Informal caregivers are defined as laypersons who provide unpaid care to a relative or friend in order to help him/her take care of him/herself. These caregivers are said to be the invisible workforce in health care as they provide the vast majority of long-term services and supports received by chronically ill persons ^{11,12}. In 2007, informal caregivers in the U.S. provided services estimated at \$370 billion annually ^{13,14}.

Prior authors have studied HF caregiving. For example, Clark and Dunbar ¹⁵ developed the Family Partnership Intervention for HF caregiver based on self-determination theory. According to this theory, HF patients change their behaviors (e.g. choosing a low-salt diet) when they accept the regulation for changes as their own and not simply as the need to comply with the demands of others. In the Family Partnership Intervention HF caregivers are taught to develop an autonomy supporting context with HF patients, offering them choices, minimizing pressure, and providing alternatives instead of criticizing and controlling patient's behaviors. This intervention underwent experimental testing ¹⁶ but the measured outcomes were family functioning and sodium intake and not how and to what extent caregivers contributed to self-care.

Sebern¹⁷ developed the Shared Care Instrument to measure the interpersonal process to exchange support in a dyadic relationships based on the assumption that each dyadic member affects each other {Sebern, 2009 #58}. The interpersonal process assessed by this instrument are related to communication, decision making, and reciprocity. The instrument is not specific for HF and the items did not explore behaviors directly involved in the HF self-care processes of maintenance and management, but has been used with the Self-Care of Heart Failure Index to analyze the correlation between shared care and patient's self-care⁶. This study showed that patients and caregiver decision making were associated with self-care maintenance and that caregiver decision making and reciprocity were correlated with patients self-care confidence. However, even though the Shared Care instrument dimensions were correlated with the patient's self-care it does not measure specific activities related to HF self-care maintenance, self-care management, and self-care confidence.

Quinn et al⁵ modified an earlier version of the SCHFI (v. 4.0)⁷ to examine whether caregivers could be used as proxy to rate self-care management and self-care confidence of HF patients. They examined the degree of congruence between 70 HF patients and their primary caregivers, asking caregivers to rate the patient's self-care. For example, one item asked: "In the past three months, has your family member had trouble breathing or ankle swelling?" In another question, caregivers were asked: "Listed below are remedies that people with heart failure use. If your family member has trouble breathing or ankle swelling, how likely are you to try one of these remedies?" Ratings between patients and caregivers did not differ significantly, illustrating strong congruence. Internal consistency reliability for the self-care management scale as measured by Cronbach's alpha was .51 for the patient and .68 for the family caregiver. For the self-care confidence scale, Cronbach's alpha was .89 for the patient and .86 for the caregiver version. The self-care maintenance scale was not included in that study.

With so few measures of the caregiver contributions to HF self-care available, the purpose of this study was to derive a measure that could capture caregiver contributions to HF patients' self-care and validate it for future use. We modified the SCHFI v.6.2 to be appropriate for caregivers, translated it into Italian, and back-translate it into English, as described below. Then we assessed the psychometric properties in an Italian sample of caregivers of patients with HF.

Methods

Design, Sample, Procedure

A cross-sectional design was used in which a convenience sample of HF patients was enrolled from 17 ambulatory cardiovascular centers in the provinces of Rome, Frosinone, Latina, Olbia, Udine, Benevento, Avellino, Messina, Reggio Calabria, Terni, L'Aquila, Livorno, Milan, Rieti, Bolzano, and Ragusa. These provinces are in the north, center and south of Italy. Of the 659 patients enrolled, 291 had caregivers who completed measures of sociodemographic characteristics and contributions to self-care, as described below. The Institutional Review Board at each site approved the study before data collection began and all participants provided informed consent.

To be enrolled in the study, caregivers had to be caring for a patient with a confirmed diagnosis of HF who had not experienced an acute coronary event in the last three months. Caregivers had to be designated by the patients as the person who provides most of their care, be oriented to person, time and place, and be able to understand the purpose of the research. If caregivers did not meet these criteria they were excluded from the study. Data collection took place during routine visits to the cardiovascular centers. Two weeks after the initial data

collection all caregivers were telephoned for re-administration of the CC-SCHFI to assess test-retest reliability. All data collection was performed by 20 nurses. These nurses received education about the study aims and protocol and were trained by the first author to collect the data using written material about the study and verbal instruction. The first author was always available by telephone during data collection and every 2 weeks he met with the data collectors to monitor study progress.

Instruments

The following instruments were used.

Socio-demographic and clinical questionnaire. This instrument was developed by the research team in order to measure socio-demographic variables related to caregivers and patients (gender, age, marital status, education, employment, income, NYHA class, hours of caregiving).

The Caregiver Contributions to the Self-care of Heart Failure Index (CC-SCHFI). The CC-SCHFI is a modification of the SCHFI v.6.2 with the same number of items (22) and scales (self-care maintenance, self-care management, and self-care confidence). The CC-SCHFI measures the contribution of caregivers to patients' HF self-care. The self-care maintenance scale has 10 items that measure symptom monitoring and adherence behaviors performed to prevent a HF exacerbation. In this section of the CC-SCHFI, caregivers are asked how often they recommend the various behaviors (e.g. weight monitoring, eating a low salt diet, taking medications) to the patient or how often they do the activities themselves because the patient is not able to do them.

The self-care management scale has 6 items that measure the caregiver's ability to recognize symptoms when they occur, treatment implementation in response to these symptoms,

and the ability to evaluate the treatments used. In the CC-SCHFI caregivers are asked “If the person you care for had trouble breathing or ankle swelling in the past month, how quickly did you recognize it as a symptom of heart failure?” Additionally, caregivers are asked: “If the person you care for has trouble breathing or ankle swelling, how likely are you to recommend (or do) one of these remedies?” Choices include: reduce salt in the diet, reduce fluid intake, take an extra water pill, and call the nurse or doctor for guidance, just as in the SCHFI v.6.2.

The CC-SCHFI self-care confidence scale uses 6 items to evaluate the caregivers’ confidence in their abilities to help the patient engage in each phase of the self-care process. For example, caregivers are asked: “In reference to the person you care for, in general, how confident are you that you can recognize changes in the patient’s health when they occur?”

Each of the three scales uses a 4-point Likert scale (never or rarely, sometimes, frequently, always or daily) with a standardized score from 0 to 100; higher scores indicate higher contribution to self-care.

The CC-SCHFI was prepared in Italian after first translating the SCHFI v.6.2 into Italian. The SCHFI was translated from English into Italian by two Italian researchers with expertise in English cardiovascular terminology. This Italian version was modified to accommodate caregivers. Then, this Italian instrument was back-translated into English by a bilingual individual with expertise in medical English who was blinded to the original version. Finally, the CC-SCHFI was reviewed by the author of the SCHFI v.6.2 to check the content validity of the new scale and the accuracy of the CC-SCHFI translation. Minor revisions to the translation were discussed by e-mail in order to assure a correspondence between the English CC-SCHFI format and the Italian version.

Data analysis

Descriptive statistics, including means and standard deviation, were used to summarize the characteristics of the caregivers and patients.

The factorial structure of the scale was examined using confirmatory factor analysis (CFA) for each separate CC-SCHFI scale, a crucial step in construct validity testing. Testing of the theoretical assumptions began with an examination of the factor structure of the Italian version of the SCHFI v.6.2¹⁸. CFA of the CC-SCHFI was carried out using the factor structure of the SCHFI v.6.2. Data were available from the full sample of caregivers for the self-care maintenance and self-care confidence scales but data for the self-care management scale were only available from caregivers who reported that their patients were symptomatic in the prior month (with problem breathing or ankle swelling). This issue of missing data on the self-care management scale for asymptomatic patients is the same as that for the SCHFI v.6.2. Patients (and caregivers) cannot judge the management of symptoms that do not occur.

Discriminant validity of the CC-SCHFI was established by comparing a subgroup of caregivers who had received self-care education with another subgroup who had not. Because the small number of caregivers in the both groups the nonparametric Mann-Whitney U test was used for this analysis.

Reliabilities for each factor and each scale derived from CFA were estimated using factor score determinacy coefficients¹⁹. These coefficients represents “an estimate of the internal consistency of the solution—the certainty with which factor axes are fixed in the variable space”²⁰ (p. 649). They represent “the squared multiple correlations (SMCs) of factor scores predicted from scores on observed variables. In a good solution, SMCs range between 0 and 1; the larger

the SMCs, the more stable the factors. A high SMC (say, .70 or better) means that the observed variables account for substantial variance in the factor scores. A low SMC means the factors are poorly defined by the observed variables”²⁰ (pp. 649-650).

Reliability of the CC-SCHFI scales was also tested with the Intraclass Correlation Coefficient (ICC); this coefficient gives an estimate of the test-retest stability of the scale scores, so it provides complementary information to that given by the internal consistency reliability.

The P value was fixed at 0.05. Statistical analysis was performed using SPSS v.19, except for the CFA, which was performed with Mplus 6.1.

Results

Description of the Sample

The total sample was composed of 291 caregivers of HF patients. Table 1 shows sociodemographic and clinical characteristics of patients. Patients were almost equally distributed between males and females with some predominance of males. Patients were more than 75 years of age on average and more than 40% of the sample was educated at only the elementary school level. Half of the patients were married and more than 30% were widowed. Most (90%) of the patient sample was not working. NYHA class was distributed throughout the four classes with most of the sample in class III and fewest in class IV.

The majority of caregivers was female with a mean age of 59 years (Table 2). Education was equally distributed in the sample and few (9%) were educated at the university level. Most (70%) caregivers were married with almost half working outside the home. Most (90%) caregivers were spouses or children and almost 40% lived with the patient. Caregivers cared for the patients for 9 hours each day on average.

Item descriptive analysis

Table 3 shows the descriptive statistics of the individual item of the CC-SCHFI. Items of the self-care maintenance scale with the highest scores were those related to “keeping doctor/nurse appointments”, “trying to avoid getting sick” and “not forgetting to take medicines”. Items addressing “exercise”, “physical activities”, and “daily weighing” scored lowest. On the self-care management scale, the items that scored lowest were “call the doctor/nurse for guidance” and “take an extra water pill”. The item with the highest score in the self-care management scale was “reduce fluid intake”. In the self-care confidence scale, “following treatment advice” and “recognizing health changes in the patient” scored highest. The items regarding confidence to “prevent HF symptoms”, “evaluate how well a remedy works” and “do something that relieves HF symptoms” were scored lowest.

Factor structure of the CC-SCHFI

Previous analyses conducted on the patient version of the SCHFI v.6.2¹⁸ revealed a complex structure of the index. Three different EFA were conducted respectively on the self-care maintenance, self-care management and self-care confidence scales. Results of these analyses were replicated across two different samples of patients, so they can be considered stable enough to represent a reference structure for the CC-SCHFI scales analyzed in this study.

Self-care maintenance scale. According to the results of the CFA on patient’s SCHFI v.6.2 scale¹⁸, a model consisting of four factors was specified. These factors were *Symptom monitoring* (items 1 and 2), *Physical activity* (items 4 and 7), *Medical treatment adherence* (items 3, 5, 6, 8, and 10), and *Sodium intake control* (items 6 and 9). All these factors were allowed to freely correlate. The initial model showed poor fit but allowing covariance between

individual items (4 and 10; 8 and 9; and 7 and 9: these covariances could be explained theoretically), the fit significantly improved: $\chi^2(25, N= 283)=30.52$, $p = 0.20$, CFI = .98, NNFI =.98; RMSEA = .028; SRMR = .031. This analytic approach is consistent with the opinions of Fornell ²¹ and by Bagozzi ²² who note that it is reasonable to let measurement errors correlate when: a) these correlations are plausible from a theoretical or methodological point of view; and b) their specification does not alter the estimates of the other parameters in the model.

Since the factors were correlated (with correlations ranging from .16 to .61 with an average correlation of .42) a second order hierarchical model was examined ²³. In this model a second order factor was posited that accounted for covariation in the first order factors. Figure 1 gives a graphical description of the final self-care maintenance model, which fit the data well: $\chi^2(27, N= 283)=37.22$, $p = 0.08$, CFI = .97, NNFI =.96; RMSEA = .037; SRMR = .036. This model shows that the factorial structure of the self-care maintenance scale, although multidimensional at the level of primary factors, is unidimensional at the level of the secondary, higher order factor. In this regard, as noted by Hattie ²⁴, “it is quite reasonable to find a second-order factor underlying a set of correlations between first-order factors and then make claims regarding unidimensionality” (p. 150).

Self-care management scale. Analysis of this scale was conducted with the 154 caregivers reporting symptoms in their patients. The CFA based on the patients’ SCHFI v.6.2 results ¹⁸ produced a model consisting of two factors: *Autonomous management* (items 11, 12, 13, and 16) and *Provider-directed management* (items 14 and 15). The fit of this model was good: $\chi^2(9, N= 154)=14.05$, $p = 0.12$, CFI = .96, NNFI =.93; RMSEA = .06; SRMR = .052. As can be easily seen in figure 2, the two factors defined by this solution were poorly correlated, with a small non significant correlation of .23. The lack of a significant correlation prevented us

from hypothesizing a second order solution for the self-care management scale. While the first factor was well defined by four items with medium to high factor loadings, the second factor had only two items with only moderate factor loadings.

Self-care confidence scale. CFA using the patients' SCHFI v.6.2 data ¹⁸ results in a model with only one factor specified (items 17 to 22). Testing a unidimension model in the CC-SCHFI resulted in a poor fit: $\chi^2(9, N= 283)=64,15$, $p <.001$, CFI = .77, NNFI =.67; RMSEA = .147; SRMR = .076. But, a closer scrutiny of the solution revealed two factors, with one factor containing items 17, 21, and 22 and another factor containing items 18, 19 and 20. The first factor related to “sophisticated” activities requiring advanced knowledge by caregivers and so was named *Advanced confidence*. The second factor included more basic activities requiring only common competence, so it was named *Basic confidence*. When the two factors were allowed to correlate, this two factor model had an excellent fit; $\chi^2(7, N= 283)=10.63$, $p=.15$, CFI = .99, NNFI =.98; RMSEA = .043; SRMR = .028. In this model the covariance between item 17 and 18 residuals was allowed to correlate as this did not alter the theoretical point of view or the parameters of the model ^{21,22}. Since the two factors presented a significant and moderately high correlation of .50, a second order hierarchical factor solution was tested. This solution was statistically equivalent to the previous solution, where the two primary factors were allowed to correlate. Figure 3 presents the path diagram and the parameter estimates of the hierarchical second order solution. As noted in the case of the self-care maintenance scale, the factorial structure of the CC-SCHFI self-care confidence scale is multidimensional at the level of primary factors, but unidimensional at the level of the secondary, higher order factor.

Discriminant Validity of the CC-SCHFI

Discriminant validity of the CC-SCHFI was established comparing a subgroup of caregivers who received education in self-care against another group of caregivers who did not. These two groups were not statistically different in relation to caregivers' and patients' ages ($p = .16$ and $.15$ respectively) or in the patient's NYHA class ($p = .36$). The first group was followed in a HF clinic where a dedicated physician met patients and caregivers every three months. During these meetings patients were examined and then, with their caregivers were educated about HF management: sodium restriction, physical activity, medication use, flu vaccination, checking weight and ankles. The second group of caregivers did not receive such education.

The CC-SCHFI was able to discriminate between the two groups in relation to the Self-care maintenance scale overall score, *Physical activity*, *Sodium intake control* and *Autonomous management* factor scores, the single item measuring likelihood of calling the doctor or nurse for guidance, and the Self-care confidence scale. These differences were statistically and clinically significant (table 4). The minimum significant difference was on the self-care maintenance scale overall score, which was 9.98 points higher in caregivers who received self-care education. The maximum difference was on the *Advanced confidence* factor, which scored 42.80 more in caregivers who received self-care education. Educated caregivers were significantly less likely to call their doctor or nurse for guidance.

Reliability of the CC-SCHFI

As described above, the internal consistency reliability of the CC-SCHFI scales derived from the CFAs were estimated using the factor score determinacies coefficients. Reliabilities of the primary factors of the self-care maintenance scale were high: $.80$ for *Symptom monitoring*, $.85$ for *Physical activity*, $.82$ for *Medical treatment adherence*, and $.80$ for *Sodium intake control*. Reliability of the second order factor was $.80$.

Internal consistency reliability of the two factors of the self-care management scale was .87 for *Autonomous management* and .65 for *Provider-directed management*. So, only the reliability estimate of the first factor was adequate, with *Provider-directed management* below the desired .70 threshold suggested by Tabachnick and Fidell ²⁰.

Internal consistency reliabilities of the primary factors of the Self-care confidence scale were high: .84 for *Advanced confidence* and .82 for *Basic confidence*. The reliability of the second order factor was .72.

Table 5 shows the test-retest reliability (stability) of the CC-SCHFI. This analysis was done with the complete sample and repeated in the subgroup of caregivers of symptomatic patients (those whose HF patient had ankle swelling or problem breathing in the last month). The ICCs were calculated for each factor and scale and separately for item number 14 (take an extra water pill) and number 15 (call doctor or nurse for guidance) as these items did not load sufficiently onto a single factor. All ICCs demonstrated excellent test-retest reliability with most of values above 0.90 for every factor and scale and for items 14 and 15.

Discussion

This is one of the first studies testing an instrument for measuring the contribution of caregivers to HF self-care. In this study we demonstrated that the CC-SCHFI is a valid and reliable method of measuring the contribution of caregivers to the self-care of HF patients.

The dimensionality of the CC-SCHFI was analyzed by means of three separate CFAs. Each one of these CFAs was conducted on the items defining each one of the three scales comprising the CC-SCHFI (self-care maintenance, self-care management and self-care confidence). The goodness of fit indices supported the hypothesized models. These analyses

showed a complex and interesting structure of the index. Self-care maintenance and self-care confidence scales showed a hierarchical structure, with several valid and reliable primary factors corresponding to narrow dimensions that allow a fine-grained assessment of caregiver contribution to HF self-care, and two valid and reliable higher order factors that support the conventional use of total scores for a more global assessment.

The factor structure of the self-care management scale was more problematic than the others. CFA of this scale allowed the identification of an *Autonomous management* factor, but showed also a narrower *Provider-directed management* factor, with low factor loadings that question its validity. However, the two individual items of this proposed construct had high test-retest reliability. More research is needed for a deeper understanding of this result, but it could be a cultural phenomenon reflecting the treatment norms in Italy. In the meantime we believe it is prudent to not sum items 14 and 15 together since they do not define a valid factor nor should they be included with the *Autonomous management* items with which they show a low correlation. In any case, because these two items measure important aspect of caregiver contribution to patient self-care we recommend their use as single measures.

Scores on the self-care maintenance, self-care management, and the self-care confidence scales were generally higher for caregivers who received self-care education compared to uneducated caregivers, demonstrating discriminant validity of the three scales. These differences were both statistically and clinically significant for the Self-care Maintenance overall scale score, *Physical activity*, *Sodium intake control*, *Autonomous management* factor, the single item on calling doctor or nurse for guidance, and the Self-care Confidence scale score overall and both factors. We saw no statistically significant differences in the *Medical treatment adherence* and *Symptom monitoring* factors; there was equal adherence to medical prescription in both groups

(e.g. avoiding getting sick, keeping medical/nursing appointment, taking medications, using system to remember taking medicines). No differences in *Medical treatment adherence* was expected, as in the Italian culture patients rely on the physician's prescription. The fact that there were no statistical differences in *Symptom monitoring* probably reflects the small subsample available for comparison.

It is interesting that educated caregivers scored lower on the item measuring calling the doctor or nurse for guidance. This suggests that educated caregivers are more confident (as the high scores at the Self-confidence scale showed) on what to do in case of HF symptoms and so they do not need to call for advice. This finding could be used to argue for the benefit of educating HF patients and caregivers about self-care. Self-care confidence overall and both factors of this scale showed the highest differences with the educated caregivers scoring much higher on both dimensions. The differences between the two factors with higher scores on *Basic confidence* might further demonstrate that activities measured by these items are easier than activities measured in the *Advanced Confidence* factor. Differences on the CC-SCHFI scores between educated and non-educated caregivers suggest that there is an opportunity in Italy to improve the quality of the education provided to patients and caregivers about HF self-care

Apart from the proposed *Provider-directed management* factor, internal consistency reliability was good for each factor and scale. Internal consistency reliability of the *Provider-directed management* factor was .65, marginally below the .70 threshold, which was probably due to the fact that the two items that loaded on this factor were only moderately correlated. Actually, this result was expected because contents of these items are very different: take an extra water pill and call doctor/nurse in case of problem breathing or ankle swelling. This result probably reflects the norms in Italy where patients are not encouraged to self-medicate. The low

score of the other item could be explained by the fact that patients were enrolled in several public cardiovascular ambulatory clinics across Italy and procedures for calling doctors/nurse for guidance in case of HF symptoms might be very different from one clinic to another. So, at least with Italian caregivers, the dimension of *Provider-directed management* is not well measured in the CC-SCHF.

The test-retest reliability was excellent for most factors and scales in the CC-SCHF. This result indicates that caregivers are stable in their contribution to patient's self-care. This "stability" of caregivers' behaviors could be very important in situations where caregivers receive specific education about how to care for patients. That is, even though patients might not be very good in HF self-care ^{25,26}, caregiver contributions might be sufficient to compensate. Because caregiver contribution to HF self-care is unknown and until now was impossible to measure, we think this could be an area for future research.

A limitation of this study was that we excluded patients' self-care data from the analysis, so, we don't know if caregivers effectively contribute to self-care. However, the study aims were to establish the "basic" psychometric properties of the instrument. Further analysis should demonstrate if CC-SCHF scores predict patients' self-care and so to establish also the predictive validity of the tool. Another limitation was that the CC-SCHF has not undergone content validity testing and some items may not be culturally relevant in the Italian population. For example, it is rare that caregivers decide autonomously to administer medicines without contacting first the physician, and in this study educated caregivers scored even less than not educated at the item queering the probability of administering a diuretic in case patient had HF symptoms. In addition, the CC-SCHF does not consider "generic" contribution to HF self-care that generally Italian family members suggest to their patients with cardiovascular disease such

as avoiding smoking, alcohol and diet with fat. Further studies using qualitative methodologies may identify items to be modified or added to the CC-SCHFI in order to make it more culturally-sensitive in an Italian population. One challenge for investigators, though, is use of the term “self-care” which is not widely used among healthcare professional in Italy. Since this is not an Italian term, researchers should use a similar term or sentences to focus caregivers on the exact meaning of self-care.

Several studies have focused on HF caregivers ²⁷⁻³⁰ and there is a general agreement that caregivers and patients influence each other’s outcomes and that stress, burden and depression in caregivers are associated with depression and hospital readmission in patients. Further studies should focus on determining if the contribution of caregivers to HF patients’ self-care has an effect on patient outcomes. It would be important to demonstrate if caregivers are even more important than patients in checking HF symptoms, facilitating patient adherence to the treatment regimen, or managing symptoms. Understanding the contributions of caregivers to HF patient self-care may provide another avenue for intervention for this common condition. Because the CC-SCHFI is equal in its contents with the SCHFI v.6.2, future studies could include a dyadic analysis to account for dependency in the dyadic data.

The CC-SCHFI was developed in an Italian population. Since its content is so similar to the SCHFI v.6.2, there are no cultural concerns regarding its use in American HF patients. Because self-care and the role of informal caregivers are influenced by culture and local healthcare systems, it is advisable for other countries to test the content validity and the psychometric properties of the CC-SCHFI before using it.

Table 1. Patients' Sociodemographic and Clinical Characteristics (n = 291)

	Mean	SD	N (%)
Gender			
Male			164 (56.4)
Female			127 (43.6)
Age	76.42	10.81	
Education			
Elementary			129 (44.3)
Middle School			68 (23.4)
Professional School			38 (13.1)
High School			43 (14.8)
University Degree			13 (4.5)
Marital Status			
Married			157 (54.0)
Single			11 (3.8)
Widowed			99 (34.0)
Divorced			24 (8.2)
Profession			
Employed			34 (11.7)
Unemployed			257 (88.3)
NYHA			
I			71 (24.4)
II			89 (30.6)
III			100 (34.4)
IV			31 (10.7)

Table 2. Caregivers' Sociodemographic Characteristics (n = 291)

	Mean	SD	N (%)
Gender			
Male			101 (34.7)
Female			190 (65.7)
Age	59.16	14.56	
Education			
Elementary			46 (15.8)
Middle School			82 (28.2)
Professional School			47 (16.1)
High School			88 (30.2)
University Degree			28 (9.3)
Marital Status			
Married			205 (70.4)
Single			42 (14.4)
Widowed			20 (6.9)
Divorced			24 (8.2)
Profession			
Employed			140 (48.1)
Unemployed			151 (51.9)
Relationship With Patient			
Spouse			110 (37.8)
Child			149 (51.2)
Friend			12 (4.1)
Nephew/Niece			8 (2.7)
Brother/Sister			6 (2.1)
Other Relatives			6 (2.1)
Caregiver living with patient			116 (39.9)
Hours of Caregiving per day	8.90	7.79	

Table 3. Descriptive Statistics for individual items of the CC-Self-Care of Heart Failure Index

Items	Mean	SD	Min	Max
Self-Care Maintenance				
How often do you recommend that the person you care for do the following things?				
(1) Weigh Daily	2.41	.93	1	4
(2) Check ankles for swelling	2.73	.96	1	4
(3) Try to avoid getting sick (get a flu shot, avoid ill people)	2.88	1.04	1	4
(4) Do some physical activity	2.46	1.10	1	4
(5) Keep doctor or nurse appointments	3.06	1.03	1	4
(6) Eat a low-salt diet	2.72	1.07	1	4
(7) Exercise for 30 minutes	2.32	1.07	1	4
(8) Remember to take medicines	2.84	1.15	1	4
(9) Ask for a low-salt items when eating out or visiting others	2.65	1.16	1	4
(10) Use a system (pill-box, reminder) to help him/her remember to take medicines	2.73	1.17	1	4
Self-Care Management				
(11) If the person you care for had trouble breathing or ankle swelling. how quickly did you recognize it as a symptom of HF?	2.47	1.07	0	4
If the person you care for has trouble breathing or ankle swelling. how likely are you to recommend (or do) one of following remedies?				
(12) Reduce salt in the diet	2.47	1.07	0	4
(13) Reduce fluid intake	2.73	1.06	1	4
(14) Take an extra water pill	2.46	1.06	1	4
(15) Call your doctor or nurse for guidance	2.28	1.19	1	4
(16) Think of a remedy you tried the last time the patient you care for had trouble breathing or ankle swelling. How sure were you that the remedy helped or did not help him or her?	2.65	1.09	1	4
Self-Care Confidence				
In reference to the person you care for, how confident are you that you can:				
(17) Prevent HF symptoms	2.29	1.09	1	4
(18) Follow the treatment advice	3.03	.99	1	4
(19) Evaluate the importance of HF symptoms	2.73	1.01	1	4
(20) Recognize health changes in the person you care for	2.87	.95	1	4
(21) Do something that relieves HF symptoms	2.51	.95	1	4
(22) Evaluate how well a remedy works	2.49	.96	1	4

Figure 1. Confirmatory factor analysis of the CC-SCHF self-care maintenance scale

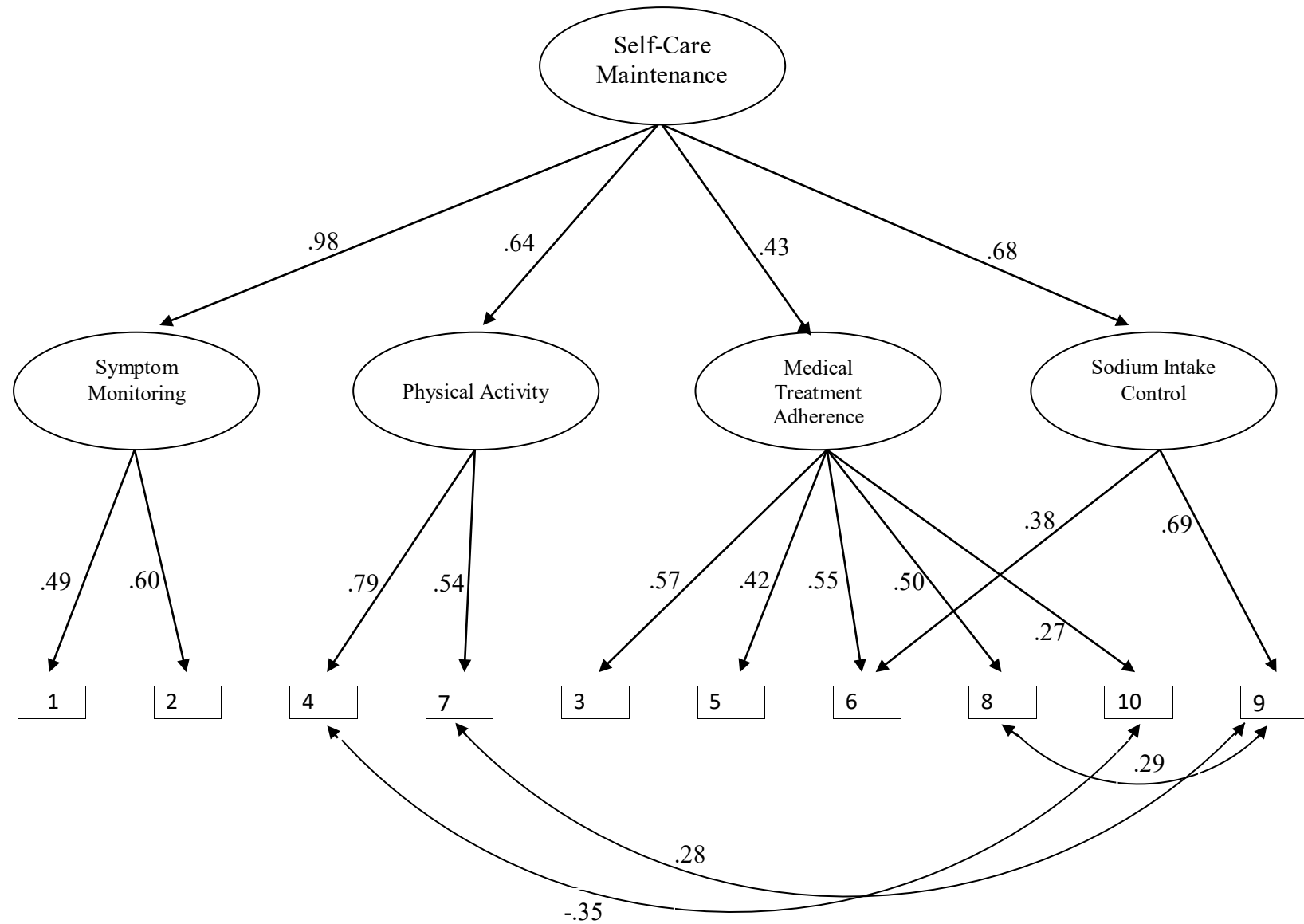


Figure 2. Confirmatory factor analysis of the CC-SCHF self-care management scale

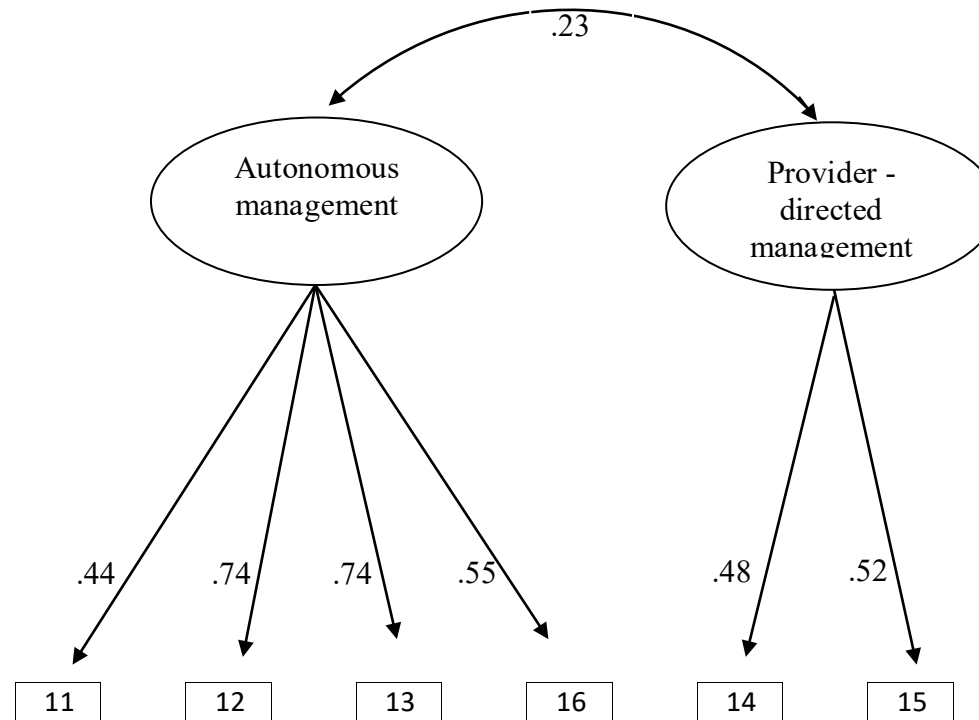


Figure 3. Confirmatory factor analysis of the CC-SCHF self-care confidence scale

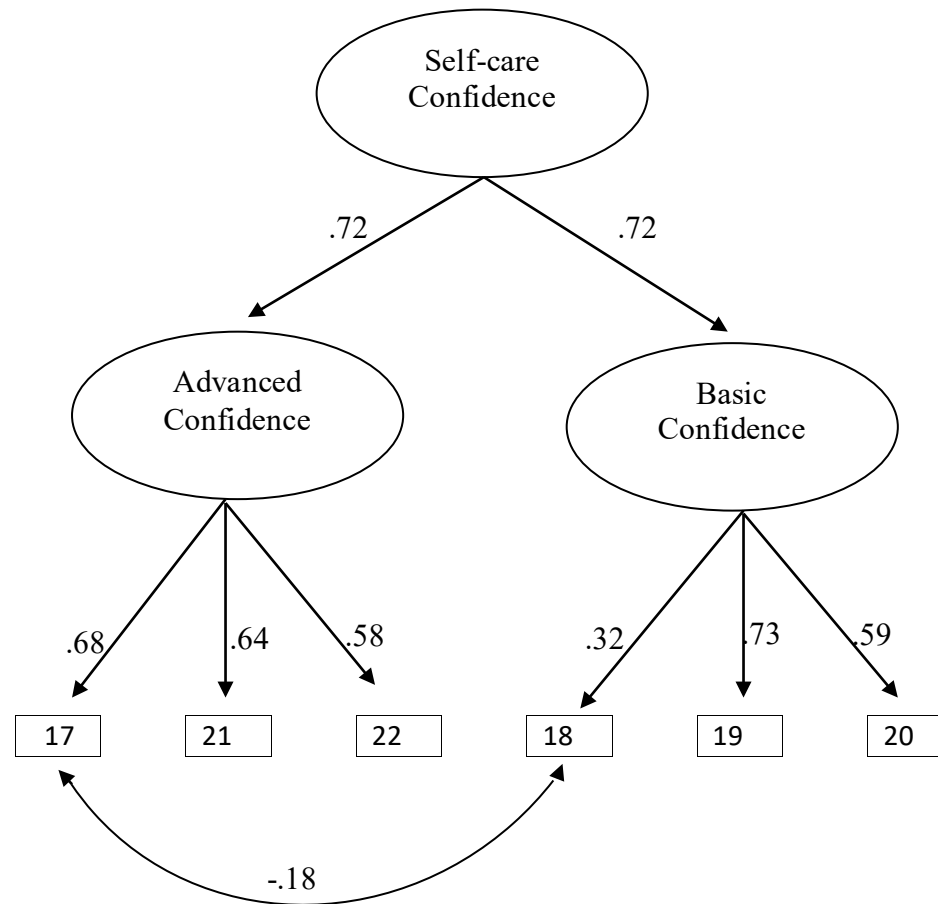


Table 4

Comparison of mean scale and factor scores between caregivers educated on heart failure self-care versus caregivers not educated specifically about self-care.

Scales and Factors				Educated Caregivers (n = 22)	Non Educated Caregivers (n = 35)	Mean Difference	p value
Caregiver Contribution to Self-Care Maintenance (overall)				70.17 (19.03)	60.19 (13.87)	9.98	.02
Symptom Monitoring				61.36 (29.27)	51.95 (21.62)	9.41	.10
Physical Activity				61.11 (30.42)	31.43 (27.35)	29.68	.00
Medical Treatment Adherence				76.32 (15.81)	75.23 (16.93)	1.09	.68
Sodium Intake Control				77.27 (35.08)	63.33 (25.18)	13.94	.02
Caregiver Contribution to Self-Care Management							
Autonomous Management				84.31(26.98)	57.87 (11.60)	26.44	.00
Item 14: Take extra water pill				21.57 (40.72)	31.47 (35.18)	- 9.9	.36
Item 15: Call doctor/nurse for guidance				35.29 (43,25)	66.66 (30.25)	- 31.33	.02
Caregiver Confidence in Contributing (overall)				84.33 (20.83)	47.54 (12.91)	36.79	.00
Advanced Confidence				77.77 (28.69)	34.97 (18.58)	42.80	.00
Basic Confidence				90.91 (15.19)	60.13 (16.89)	30.78	.00

Note. Scales and Factors' scores were standardized to 0 – 100. As suggested by the CFA, only scores from the *Autonomous management* factor and item n. 14 and 15 were computed for the Self-care Management scale.

Table 5. Test-retest reliability of the CC-Self-Care of Heart Failure Index (full sample and only symptomatic patients)

Scales and Factors	ICC (95% CI)	
	Full sample (n=291)	Only symptomatic patients (n=134)
Self-Care Maintenance (overall)	.92 (.90 - .94)	.92 (.90 - .94)
Symptom Monitoring	.90 (.87 - .92)	.92 (.90 - .94)
Physical Activity	.87 (.84 - .90)	.93 (.89 - .95)
Medical Treatment Adherence	.87 (.83 - .89)	.92 (.91 - .95)
Sodium Intake Control	.92 (.91 - .94)	.93 (.91 - .96)
Self-Care Management		
Autonomous Management		.96 (.94 - .97)
Item n. 14: Take extra water pill		.93 (.91 - .94)
Item n. 15: Call doctor/nurse for guidance		.95 (.93 - .96)
Self-Care Confidence (overall)	.93 (.91 - .94)	.94 (.91 - .96)
Advanced Confidence	.94 (.92 - .93)	.94 (.92 - .96)
Basic Confidence	.92 (.90 - .94)	.93 (.90 - .95)

Note. Test-retest reliability was calculated with the intraclass correlation coefficient (ICC) correlating the CC-SCHFII scores collected twice with a 15 day interval between testing. Test retest for the self-care management was computed only with 134 patients who were symptomatic at both intervals. $P < .001$ for each correlation.

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What's New?

- The Caregiver Contribution to Self-Care of Heart Failure Index (CC-SCHFI) is a new instrument driven from the Self-Care of Heart Failure Index v.6.2 that measures the contribution of caregiver to the self-care maintenance, self-care management and self-care confidence in Heart Failure (HF) care;
- The CC-SCHFI has good psychometric characteristics of validity and reliability and can be used in clinical settings and research.