The influence of preparedness, mutuality, and self-efficacy on home care workers' contribution to self-care in heart failure : A structural equation modeling analysis

Sterling, Madeline, Barbaranelli, Claudio, Riegel, Barbara, Stawnychy, Michael, Ringel, Joanna Bryan, Cho, Jacklyn and Vellone, Ercole

This is a pre-copyedited, author-produced version of an article accepted for publication in *Journal of Cardiovascular Nursing*. The published version of record Sterling, M., Barbaranelli, C., Riegel, B., Stawnychy, M., Ringel, J. B., Cho, J. and Vellone, E. (2022). The influence of preparedness, mutuality, and self-efficacy on home care workers' contribution to self-care in heart failure : A structural equation modeling analysis. *Journal of Cardiovascular Nursing*, 37(2), pp. 146-157 is available online at: https://doi.org/10.1097/JCN.0000000000000768

HHS Public Access

Author manuscript

J Cardiovasc Nurs. Author manuscript; available in PMC 2023 January 01.

Published in final edited form as:

J Cardiovasc Nurs. 2022 ; 37(2): 146–157. doi:10.1097/JCN.0000000000000768.

The influence of preparedness, mutuality and self-efficacy on home care workers' contribution to self-care in heart failure: A structural equation modeling analysis

Madeline R. Sterling, MD, MPH, MS[1], **Claudio Barbaranelli, PhD**[2], **Barbara Riegel, PhD, RN, FAHA**[3], **Michael Stawnychy, MSN, CRNP**[3], **Joanna Bryan Ringel, MPH**[1], **Jacklyn Cho, BS**[1], **Ercole Vellone, PhD, RN, FESC**[4]

[1]Division of General Internal Medicine, Weill Cornell Medicine, New York, NY, USA

[2]Sapienza University of Rome, Italy

[3]School of Nursing, University of Pennsylvania, Philadelphia, PA, USA

[4]University of Rome Tor Vergata, Italy

Abstract

Background: Home care workers (HCWs) are increasingly caring for heart failure (HF) patients. Prior studies have shown that they contribute to HF patients' care, but how their preparedness and their relationship with patients (mutuality) influence caregiving is unknown as well as the role of HCWs' self-efficacy.

Objective: Guided by the Situation-specific Theory of Caregiver Contribution to HF self-care, we investigated the influence of HCWs' preparedness and mutuality on HCWs' contribution to HF self-care and the mediating effect of HCWs' self-efficacy in the process.

Methods: We conducted a cross-sectional survey of HCWs who cared for HF patients. The survey included the Caregiver Preparedness Scale (CPS), Mutuality Scale (MS), Caregiver Contribution to Self-Care of HF Index (CC-SCHFI), and the Caregiver Self-Efficacy in Contributing to Self-Care Scale. We performed structural equation modeling (SEM) and a mediation analysis.

Results: A total of 317 HCWs employed by 22 unique home care agencies across New York, NY completed the survey. They had a median age of 50 years, 94% were women, and 44% were Non-Hispanic Black. Results demonstrated that mutuality had a direct influence on HCW contribution to self-care and preparedness influenced their contribution to self-care, but only through the mediation of self-efficacy.

Conclusion: HCWs' preparedness, mutuality, and self-efficacy have important roles in influencing their contribution to HF self-care. As a workforce increasingly involved in the care

Corresponding author: Madeline R. Sterling MD, MPH, MS, Assistant Professor of Medicine, Weill Cornell Medicine, 420 East 70th Street, Box 331, New York, NY 10021, Phone: 646-962-5029, mrs9012@med.cornell.edu, Twitter: @mad_sters.

Disclosures: Drs. Sterling, Vellone, Barbaranelli, and Riegel have nothing to disclose. Ms. Bryan and Cho have nothing to disclose. Mr. Stawnychy has nothing to disclose.

of HF patients, knowing the mechanisms underpinning HCWs' contribution to self-care may illuminate future interventions aimed at improving their contributions and HF patient outcomes.

Background

HF affects 6.2 million people in the US and is associated with a high risk of morbidity, mortality, and frequent hospitalizations.[1–3] HF requires that patients perform a high degree of self-care.[4] Self-care is defined as a naturalistic decision-making process that helps patients with HF to maintain the stability of the disease (self-care maintenance), to perceive signs and symptoms of the disease (symptom perception) and to respond to changes in those signs and symptoms (self-care management).[5] This can be challenging since many HF patients have multiple co-morbid conditions,[6] as well as cognitive,[7, 8] functional,[9] and sensory impairments.[10, 11] As such, HF patients often rely on caregivers for help at home.[12, 13]

Increasingly, adults with HF are relying on paid home care workers (HCWs) for personal and medically-oriented assistance.[14–16] Indeed, HCWs represent one of the fastest growing sectors of the health care industry.[17] There are currently 2.3 million HCWs in the US and the field is expected to grow by 38% by 2024.[18, 19] Largely employed by licensed and certified home care agencies that receive Medicaid and Medicare funding, HCWs collectively care for 48 million Americans and account for 74 billion dollars of healthcare spending per year. HF is one of the top conditions for which HCWs provide care.[19, 20] Unlike other health professionals, HCWs are with HF patients on a near-daily basis, giving them a unique vantage point from which to observe, support, and advise patients.[21] And unlike family caregivers, who may or may not receive any training on personal or medical care, HCWs are trained and certified health professionals.[19] Prior qualitative studies have found that in HF, HCWs are integral -- often preparing low salt meals, monitoring their patients' weight and blood pressure, reminding them to take medications, and providing assistance during doctors' appointments. Yet, despite this involvement, HCWs often feel unprepared and lack confidence with HF caregiving.[22] These findings, as well as how HCWs' relationships with patients affects their contributions to care, have not been investigated quantitatively.

According to the Situation-Specific Theory of Caregiver Contributions to HF Self-Care,[23] caregiver contribution (CC) to HF self-care is influenced by variables at the caregiver-, patient- and dyadic-level. At the caregiver- and dyadic-levels, two variables that can influence CC are preparedness and mutuality, respectively. Preparedness is defined as the perceived preparation of a caregiver to care for the emotional and physical needs of a care recipient[24] and mutuality is defined as the positive quality of the relationship between a caregiver and a care recipient.[24] Beyond their effect on CC and self-care, these two factors are also associated with improved patient outcomes, such as quality of life.[25] The Situation-Specific Theory of Caregiver Contribution to HF self-care states that caregiver and dyadic-level variables may influence CC to HF self-care both directly and indirectly through caregiver self-efficacy. Although a few studies have demonstrated that caregiver self-efficacy mediates the association between caregiver preparedness and CC to self-care,[26] it is unclear if this pertains to paid HCWs. Additionally, while some evidence exists among family caregivers that preparedness and mutuality influence CC to HF self-care, no studies have

examined whether the same process occurs among HCWs. Since caregiver self-efficacy, preparedness, and mutuality could all potentially be modified with interventions, elucidating these mechanisms is important to improve health care delivery among HF patients cared for by HCWs.

The aim of this study was to examine the influence of preparedness, mutuality and self-efficacy on CC to HF self-care among HCWs caring for HF patients. Specifically, we hypothesized that HCWs': (1) preparedness covaries (or is associated) with HCWs' mutuality; (2) preparedness and mutuality influence HCWs' self-efficacy; (3) self-efficacy influences HCWs' contribution to HF patient self-care maintenance and management; (4) self-efficacy mediates the relationship between preparedness and mutuality and contributions to HF patient self-care maintenance and management; and (5) contributions to HF patient self-care maintenance influences HCW contributions to self-care management (Figure 1). Additionally, since the instruments used to assess these concepts have not been previously tested among HCWs, we also sought to test their psychometric characteristics, such that they could be used in prior studies, if found to be valid and reliable.

Methods

Design, Setting, and Sample

A cross-sectional design was used to study HCWs caring for HF patients between August 2018 and May 2019. HCWs were eligible for participation if they cared for a HF patient in the past year, had more than 1 year of experience on the job, and were able to read and write English. To conduct the survey, we partnered with the 1199SEIU- Home Care Industry Education Fund (Education Fund), a benefit fund of the 1199 Service Employees International Union United Healthcare Workers East. This is the largest healthcare union in the United States and represents more than 400,000 workers in hospitals, nursing homes, clinics, pharmacies, and home care agencies.[27] The Education Fund is a 501(c)(3) charitable organization that offers training to HCWs.[28] Each year the organization trains between 15,000 and 20,000 HCWs employed by 55 home care service agencies across New York, NY. In order to obtain an even more diverse sample, we also directly partnered with agencies in New York, NY not associated with the Education Fund.

Survey Instrument

Data collection was performed with the following instruments. The Caregiver Preparedness scale (CPS)[24] is an 8-item unidimensional instrument that evaluates the extent to which a caregiver feels prepared to meet the psychological and physical needs of a patient. An example item is: "*How well prepared do you think you are to take care of your patient's physical needs?"* The CPS is a valid and reliable measure (Cronbach's alpha=0.91)[29] of preparedness among caregivers of older adults,[24] stroke survivors,[29] and patients with HF.[30] Each item uses a 5-point Likert scale (responses range from "Not at all prepared" [score 0] to "Very well prepared" [score 4]). The total scale score, which is a mean of all items scores, ranges between 0 and 4 with higher score indicating better preparedness.

The Mutuality Scale (MS)[24] is a 15-item scale that measures the positive quality of the relationship between a caregiver and a care recipient. An example item is: *"How close do you feel to him or her?"* The MS includes four domains (love and affection, shared pleasurable activities, shared values, and reciprocity) and has been tested and found to be reliable (Model-based internal consistency index=0.94)[31] among caregivers of older adults,[24] stroke survivors,[32] and patients with HF.[31] Each item uses a 5-point Likert scale (responses range from "Not at all" [score 0] to "A great deal" [score 4]). The total score, which is a mean of all item scores, ranges from 0 to 4 with higher scores indicating a more positive quality of the relationship between the caregiver and the care recipient.

The CC-SCHFI[33] is a 22-item instrument divided into three scales: CC to self-care maintenance, CC to self-care management, and caregiver confidence in contributing to self-care. For this study only the first two scales were used. The CC to self-care maintenance scale, with 10 items, measures the extent to which caregivers of patients with HF recommend behaviors aimed at maintaining HF stability (e.g., taking medications as prescribed); the CC to self-care management, with six items, measures caregivers' responses in dealing with signs and symptoms of a HF exacerbation (e.g., calling the provider in case of shortness of breath). The CC-SCHFI was found to be a valid and reliable instrument (Factor Score Determinacy Coefficient 0.80 – 0.87).[33] All CC-SCHFI scales uses a 4-point Likert format for responses and have a standardized score between 0 and 100 with higher scores indicating a greater contribution to HF patient self-care. A cut point of ≥70 is considered adequate.

The Caregiver Self-Efficacy in Contributing to Self-Care Scale is a 10-item instrument which measures caregiver self-efficacy in helping a patient perform self-care in chronic conditions. This instrument was derived from the Self-Care Self-Efficacy Scale (Yu et al. under review) that is used to measure self-care self-efficacy in patients. We transformed each scale item to measure the same content measured for patients, but to measure caregiver self-efficacy. For example the item *"How confident are you that you can keep yourself stable and free of symptoms?",* which is used for patients, became: "In reference to the person you care for, *"how confident you are that you can keep the person you care for stable and free of symptoms?"* Each item uses a 5-point Likert style response. Scores are standardized from 0 to 100 with higher scores indicating better caregiver self-efficacy. A cut point of ≥70 is considered adequate.

The survey also collected HCWs' demographics, employment history, and experience with HF patients. The survey was piloted and refined for ease and comprehensibility with 5 HCWs not included in the final study. The sample size was established based on the literature that recommends no less than 200 participants.[34] A post-hoc power analysis was conducted which focused on the Root Mean Square Error of Approximation (RMSEA) fit indices and followed Preacher and Coffman (2006).

Data Collection

The study was approved by the Institutional Review Board of Weill Cornell Medicine. Paper surveys were distributed by Education Fund and home care agency staff during the study period. Staff used a pre-written recruitment script to screen HCWs for eligibility and, if

agreeable, the participants provided written informed consent. Participants then completed the survey in quiet rooms. Once completed, participants were entered into a raffle to be eligible to receive small compensation in the form of a gift card.

De-identified data from the survey were entered electronically into Research Electronic Data Capture (REDCap), a web-based, secure, data storage program.[35] Double data entry was used to assure accuracy. Quality in the reporting of our findings was assessed using the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines for cross-sectional studies.[36]

Data analysis

Data analysis was performed in four phases. In the first phase, we performed descriptive statistics on the overall study population with frequencies and means; medians and interquartile ranges (IQRs) are reported for non-normally distributed data.

Since the instruments used in this study (CC-SCHFI, CPS and MS) were not previously tested among HCWs, in the second phase we tested their psychometric characteristics (model measurement testing). We started our psychometric analysis by testing instrument dimensionality with confirmatory factor analysis (CFA). At CFA, the following goodness of fit indices were used to evaluate the model fit:[37, 38] Comparative Fit Index (CFI) and Tucker and Lewis Index (TLI) with values between .90 and .95 indicating acceptable fit, and values > .95 indicating good fit;[39] RMSEA with values ≤ .05 in the lower bound of 90% confidence interval indicating a well-fitting model, values between .05 and .08 indicating a moderate fit, and values ≥ .10 indicating poor fit;[40] RMSEA estimates are given along with 90% confidence interval limits and values ≤ .05 to ≤.08 indicates good fit; RMSEA test of close fit with a p values > .05 indicating good fit; Standardized Root Mean Square Residual (SRMR)[41] with values ≤ .08 indicating good fit.[39] We also used traditional chi-square statistics to evaluate the model fit, however, because the Chi-square statistics are sensitive to sample size, they must be interpreted with caution. After CFA, we evaluated the instruments' internal consistency reliability with composite reliability[42] (or omega coefficient)[43] and with the global reliability index for multidimensional scales, where values ≥ 0.70 are considered adequate.[44]

In the third phase, guided by the Situation-specific Theory of Caregiver Contribution to HF self-care, a full structural equation modeling (SEM) analysis was performed (see Figure 1). Specifically, we tested a correlation between HCWs' preparedness and mutuality; the influence of HCWs' preparedness and mutuality on both HCWs' contribution to self-care maintenance and management; and the influence of HCWs' contribution to self-care maintenance on HCWs' contribution to self-care management. Self-efficacy was also considered in the SEM since we hypothesized that self-efficacy is influenced by preparedness and that it influences both maintenance and management, and thus could be a mediator. Due to the number of items, we tested the above model using a full SEM approach, where each one of the constructs was measured by "item-parcels".[45] The construction of the parcels was performed using the item-to-construct balance strategy[46] where two to three balanced parcels were built examining the *item-to-construct* relations (as represented by factor loadings in the item-level factor analyses). Only in the case of CC-

SCHFI caregiver contribution to self-care maintenance scale (which had a multidimensional structure, described below) parcels were created using the *domain representativeness approach*,[45] where parcels are constructed in the order that each parcel is constituted by items showing a factor loading on different first-order factors.[47] The model fit for the SEM was evaluated with the same fit indices as CFA.

In the fourth phase we tested the mediation of self-efficacy between HCWs' preparedness and mutuality and HCWs' contribution to self-care maintenance and management by evaluating the indirect effects. This analysis, in particular, uses the parameters derived from the SEM model tested in the third phase to compute the mediation or indirect effects due to self-efficacy.

Data were analyzed using Stata 14 (StataCorp, College Station, TX) and Mplus version 8.2 (Muthén & Muthén, 1998–2017).

Results

Characteristics of participants

A total of 317 HCWs employed by 22 unique home care agencies across New York, NY participated (Table 1). Participants had a median age of 50 years (interquartile range [IQR] 37, 57), 94% were women, 43% were Non-Hispanic Black and 23% were Hispanic, 79% had a high school education or greater, and 71% were foreign-born. Participants had a median of 8 years (IQR 4, 16) of experience as paid caregivers and worked for a median of 2 home care agencies (IQR 1, 2). A total of 71% of participants reported caring for a total for 1–5 HF patients during their career, 19.2% reported 6–10 HF patients, 5.7% 11–15 HF patients, and 4.1% reported caring for greater than 15 HF patients previously. Participants reported typically spending a median of 20 hours per week (IQR 8, 36) caring for a patient with HF. The majority (65.6%) of participants reported receiving none to a little formal HF training in the past.

Overall, participants felt prepared for HF caregiving (CPS mean 3.86 [SD: 0.93]) and had moderately positive relationships with their HF patients (MS mean 3.87 [SD: 0.76]). A total of 63% of participants contributed adequately to self-care maintenance activities (Mean 72.98 [17.87]), 35.1% to self-care management activities (58.81 [20.28]), and 42% had adequate self-efficacy with HF caregiving (58.81 [20.28]) (Table 1).

Model Measurement Testing

Caregiver Preparedness Scale (CPS)

Dimensionality.: Following advice from Petruzzo and colleagues,[30] a one-factor CFA model was tested on the CPS 8-items. With respect to the original model,[30] we specified a covariance between the residuals of items 6 and 7 (r=0.78) and 1 and 2 (r=0.34). These covariances are plausible because items 6 and 7 pertains to preparedness in health-care aspects (i.e, handling emergencies and getting information from health-care system); items 1 and 2 pertain to physical and emotional needs. This model resulted in an adequate fit, $\chi^2(18, N = 315) = 66.41$, $p<.001$; RMSEA = .09, $p<.01$, 90%CI = [.07, .12]; CFI = .97; TLI =

.96; SRMR = .03. Factor loadings were high, illustrating a substantial proportion of common variance among the items (Table 2).

Internal coherence.: Since the CPS is unidimensional, we used the composite reliability (or omega) coefficient to compute internal coherence from the parameters of the factorial model. In doing this, we applied a formula that introduces a penalty for residual item covariances. Notwithstanding this correction, this coefficient was very good at .86.

Mutuality Scale (MS)

Dimensionality.: Following guidance from Deallafiore and colleagues,[48] a model positing 4 primary factors and 1 second order factor was tested. This model did not fit well. Thus, an Exploratory Structural Equation Model (ESEM) analysis was performed, supporting a simpler model with 2 primary factors and a second order factor. In this model the first factor combines the original Love, Shared Pleasurable Activities, and Shared Values factors and two items of the Reciprocity factor. The second factor corresponds to a narrow version of Reciprocity with only 3 items loadings on it. Also, in this model we specified the covariance between residuals of items 14 and 15 (r=0.033), items 11 and 14 (r=0.095), items 2 and 5 (r=0.080), and items 6 and 10 (r=0.183). Residuals of items 14 and 15 could be correlated because patients cared for by HCWs may express feelings of warmth towards patients when they enjoy time together; residuals of items 11 and 14 could be correlated because enjoying time together may also represent an occasion to laugh together; correlations between residuals of items 5 and 2 are probably due to the fact that these items are very similar, both pertaining to closeness and attachment. Finally, correlations between residuals of items 6 and 10 are both focused on help. This model resulted in an adequate fit, $\chi^2(78, N = 232) = 149.1$, $p<.001$; RMSEA = .063, p=.09, 90% CI = [.047, .078]; CFI = .963; TLI = .950; SRMR = .034. Factor loadings were high, thus attesting to a substantial proportion of common variance among the items (Table 2).

Internal coherence.: Since the MS was intended to yield a single score, not two different scores related to the different aspects of the construct, having posited a second-order factor underlying the “multidimensional” two first order factors seen in the scale, as with the other multidimensional scales, we computed the model based internal consistency coefficient.[49] This coefficient was .933. Thus, the MS produced a unidimensional score.

CC-SCHFI Self-care maintenance scale

Dimensionality.: Riegel and colleagues[50] posited a single factor underlying the 10 items composing the self-care maintenance scale. Thus, we first specified a one-factor model. This model was largely unsatisfactory, with poor fit indices, $\chi^2(35, N = 317) = 210.91$, $p<.001$; RMSEA = .13, $p<.001$, 90%CI = [.11, .14]; CFI = .89; TLI = .86; SRMR = .08. A multidimensional alternative model was then specified, derived substantially from Vellone, Riegel and colleagues,[51] where items 1, 2 and 3 were measures of a *Symptom Monitoring* factor, items 4, 7 were measures of a *Physical Activity* factor, items 6, 9 were measures of a *Sodium Intake* factor, and items, 5, 8, 10 were measures of a *Medical Treatment Adherence* factor (Table 3). Also, we specified a correlation between residuals of items 3 and 5. This correlation is plausible because these items are both related to medical care

(trying to avoid getting sick and keep doctor or nurse appointments). In coherence with the hypothesized unidimensionality, we posited a second order factor influencing the four first order factors. This four factor second-order model resulted in an excellent fit, $\chi^2(30, N = 317) = 68.46$, $p<.001$; RMSEA = .06, p=.12, 90% CI = [.044, .08]; CFI = .98; TLI = .96; SRMR = .05. Table 3 reports CFA results, including estimates from the Mplus output completely standardized solutions. Factor loadings were generally medium to high, thus attesting to a substantial proportion of common variance among the items (Table 3). Second order loadings were all above .70, attesting to a significant and coherent association among the different facets of self-care maintenance.

Internal coherence.: Since the self-care maintenance scale presents a complex second-order structure, the more appropriate coefficient to evaluate the internal coherence of the scale is the model based internal consistency coefficient.[49] When computed, this coefficient was 0.88. Although the dimensionality of this scale is complex, as noted by Bentler (p. 343),[52] "every multidimensional coefficient implies a particular composite with maximal *unidimensional* reliability." Thus, the final reliability estimates derived with appropriate methods "can be interpreted to represent a unidimensional composite."[52]

CC-SCHFI Self-care management scale

Dimensionality.: Riegel and colleagues[50] posited a single factor underlying the 6 items composing the self-care management scale. Accordingly, we first specified a one-factor model. This model was unsatisfactory, with poor fit indices due mainly to the presence of 2 covariances (between items 11 and 16 and between items 13 and 14) among residuals associated with significant Modification Indices. These covariances could be because items 11 and 16 are related to symptoms, and items 13 and 14 are related to fluid management. Once these two covariances were specified, the model had an excellent fit, $\chi^2(7, N = 317) = 8.15$, p=.32; RMSEA = .023, p=.75, 90% CI = [.00, .08]; CFI = .998; TLI = .99; SRMR = .02. Table 2 reports CFA of the tested model, including estimates from the Mplus output completely standardized solutions. Factor loadings were generally medium to high, thus attesting to a substantial proportion of common variance among the items.

Internal coherence.: Since the self-management scale was unidimensional, we used the composite reliability (or omega) coefficient to compute internal coherence from the parameters of the factorial model. In doing this, we applied the specific formula which introduces a penalty due to residual items covariances: Notwithstanding, the omega was adequate at .70.

Caregiver Self-Efficacy in Contributing to Self-Care Scale

Dimensionality.: Yu and colleagues (under review) posited a single factor underlying the 10 items composing this scale. Thus, we first specified a one-factor model. This model was unsatisfactory, with ambiguous fit indices, $\chi^2(35, N = 317) = 412.62$, $p<.001$; RMSEA = .18, p<.001, 90%CI = [.17, .20]; CFI = .98; TLI = .98; SRMR = .04. An Exploratory Structural Equation Model suggested the presence of two highly correlated factors, one composed of items 1 to 6, and the other composed of items 7 to 10. The first factor was named Self-Efficacy in *maintenance* and *monitoring* because the items included in this factor

are focused on maintaining the disease and monitoring symptoms or conditions. The items of the second factor are focused on the management of symptoms (Table 3). In coherence with this result, and in the wake of the original hypothesized unidimensionality, we posited a second order factor influencing the two first order factors. This two factor second-order model had an adequate fit, $\chi^2(34, N = 317) = 127.97$, $p<.001$; RMSEA = .09, $p<.001$, 90%CI = [.08, .111]; CFI = .99; TLI = .99; SRMR = .02. Table 3 reports CFA results of this two-factor model, including estimates from the Mplus output completely standardized solutions. Factor loadings were high, thus attesting to a substantial proportion of common variance among the items. Second order loadings were above .90, attesting to a significant and coherent association among the different facets of self-care self-efficacy (Table 3).

Internal coherence.: Again, we used the model based internal consistency coefficient to assess scale internal coherence,[49] was .955. Thus, the self-care self-efficacy scale can be interpreted as a unidimensional score.

Structural Equation Model Testing

The SEM that we tested (Figure 2) had the following supportive fit indices: $\chi^2(68, N = 317) = 120.76$, $p<.001$; RMSEA = .05, $p=.50$, 90%CI = [.035, .06]; CFI = .98; TLI = .98; SRMR = .04. We found these significant paths: preparedness and mutuality covaried (r=.47); preparedness influenced HCWs' self-efficacy (β=.79); mutuality influenced HCWs' contribution to self-care maintenance (β=.25); HCWs' self-efficacy influenced their contributions to self-care maintenance (β=.22) and management (β=.52). HCWs' contribution to self-care maintenance influenced their contribution to self-care management (β=.47) (Figure 2). The model explained 61% of the variance in HCWs' self-efficacy, 20% of the variance in HCWs' contribution to self-care maintenance, and 71% of variance in HCWs' contribution to self-care management.

Post-hoc power analysis—We conducted a post-hoc power analysis to establish the power and the minimum sample size needed for the RMSEA, the main index used to evaluate model's fit.[53] We found that with a sample of 317 HCWs, the power to reject the null hypothesis of RMSEA was very good (> .80) for all of our models with two exceptions: (1) the CC-SCHFI self-care management scale and (2) the CPS. For the CC-SCHFI self-care management scale, we found that the fit was almost perfect so the non-significant RMSEA and chi-square were not due to a small sample but reflect a real absence of discrepancy among the observed and the fitted covariance matrices. With respect to the CPS, we found that for the RMSEA, the results should be interpreted with caution, however all other fit indices converge suggesting that there is at least an approximate fit. Finally, our post-hoc analyses suggest that the power for the SEM is 0.98.

Mediation Analysis

The mediation analysis demonstrated that HCW self-efficacy fully mediated the relationship between preparedness and contributions to self-care maintenance (effect=.17) and management (effect=.41) (Table 4). However, self-efficacy did not mediate the relationships between mutuality and HCWs' contribution to self-care maintenance and management.

Discussion

In this study of 317 HCWs who cared for HF patients across New York, NY we examined the relationships between HCWs' preparedness and mutuality; the influence of both HCWs' preparedness and mutuality on HCWs' contribution to self-care maintenance and management; and the influence of HCWs' contribution to self-care maintenance on HCWs' contribution to self-care management. We also examined whether HCWs' self-efficacy mediated these relationships. Overall, we found that HCWs' preparedness and mutuality influenced their contribution to HF self-care maintenance and management but in different ways. In the mediation analysis we found that while HCWs' mutuality had a direct effect on their contribution to self-care, HCWs' preparedness influenced their contribution to self-care only indirectly through the mediating effect of self-efficacy. In other words, a good relationship between a HCW and a patient directly influenced the HCWs' contribution to self-care. But a HCWs' preparedness influenced self-care by influencing self-efficacy. Thus, self-efficacy, a modifiable factor, seems to play a key role in HCWs' contribution to HF self-care. In addition, we demonstrated that the instruments tested in this study are psychometrically sound instruments for measuring caregiver preparedness, mutuality, CC to patients' HF self-care, and self-efficacy among HCWs. Their use will allow for a more comprehensive understanding of HCWs' role in caregiving in future studies.

Our findings expand upon prior qualitative reports that found that HCWs contributed to the care of HF patients, but often lacked HF-specific training and caregiving self-efficacy.[22, 54, 55] While we also found this to be true, by evaluating CC to HF-self care we were able to elucidate where HCWs contributed the most. For example, while the majority of HCWs contributed adequately to self-care maintenance activities, only one third contributed adequately to HF management activities. There are two possible reasons for this. First, HCWs may lack training or may not feel empowered to manage patients' symptoms. Second, failure to contribute to self-care management may be appropriate for HCWs. That is, HCWs' scope of care may prohibit them from management activities, such as instructing patients to take medications, like furosemide. Tasks like these may well fall to a supervising home care nurse or to the patient and their family members themselves. Notably, we found that despite high preparedness scores, less than half of the HCW had adequate self-efficacy. This may be because many of the instrument items pertain to personally oriented care, such as activities of daily living, in which HCWs have extensive training and experience, whereas the self-efficacy scale pertains more to HF-specific clinical situations.

Our findings regarding the relationships among HCWs' preparedness, mutuality, and CC are similar to prior studies that have examined these relationships among family caregivers. For example, a prior qualitative study among family caregivers found that many family caregivers lack confidence with HF caregiving.[56] A recent study of family caregivers found that higher scores in caregiver preparedness were associated with higher scores in caregiver confidence, and higher caregiver confidence was associated with higher contributions by caregivers to self-care maintenance and management.[26] Similar to our study, the authors found that caregiver self-efficacy mediated the association between caregiver preparedness and caregiver contributions to self-care maintenance and management. Additionally, a prior study of patient-family caregiver dyads found that patients and caregivers with higher

mutuality were more confident with HF self-care.[57] These authors also found that mutuality was associated with less caregiver burden, which we did not study. Taken together, it is plausible that interventions that effectively target these domains in family caregivers might also be useful in HCWs, since the underlying mechanisms appear similar.

Strengths and Limitations

This study has several strengths. We recruited a diverse sample of HCWs from over 20 licensed home care agencies across New York, NY. We conducted rigorous testing of these instruments and the relationships among the variables they measure. This is first study to validate these instruments in HCW. We also note some limitations. First, this study was conducted among a relatively experienced group of English-speaking agency-employed HCWs from a single large urban area in the U.S., which may affect its generalizability to HCWs who are privately hired by HF patients or those working in suburban or rural areas, as well as non-English speakers. Second, we lacked patient-level data. Third, the RMSEA results for the CPS should be interpreted with caution since the post-hoc power analysis found that this test does not have an adequately strong power. Finally, the design was cross-sectional, thus causal interpretation of the paths in the SEM must be done with caution and replicated in other samples.

Conclusion

While HCWs' preparedness heavily influenced their contribution to HF self-care, HCWs' self-efficacy, mediated this relationship. Self-efficacy, a modifiable factor, plays a key role in HCWs' contribution to HF self-care. As such, understanding what factors predict self-efficacy among HCWs, as well as what interventions have the potential to modify it, will be important. As this workforce takes an increasing role in the care for HF patients, the mechanisms underpinning the relationships among HCWs' preparedness, mutuality, self-efficacy, and self-care warrant further study. Additional research which examines the dyadic effect of how mutuality, preparedness and self-efficacy among HCWs affects patient outcomes is needed.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements:

We would like to thank the staff of the 1199SEIU Home Care Industry Education Fund, as well as the leadership and staff of home care agencies who participated, without whom this study would not have been possible. We would also like to thank all of the HCWs who participated.

Funding: This research was made possible, in part, through a generous donation by Douglas Wigdor, Esq. Dr. Sterling and this research are supported by the National Heart, Lung, and Blood Institute (K23HL150160). Dr. Riegel is supported by the National Institute of Nursing Research of the National Institutes of Health (R01NR018196).

REDCap at Weill Cornell Medicine is supported by Clinical and Translational Science Center grant UL1 TR002384.

References

1. Yancy CW, Jessup M, Bozkurt B, et al. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol. Oct 15 2013;62(16):e147–239. doi:10.1016/j.jacc.2013.05.019 [PubMed: 23747642]
2. Mozaffarian D, Benjamin EJ, Go AS, et al. Heart Disease and Stroke Statistics-2016 Update: A Report From the American Heart Association. Circulation. Jan 26 2016;133(4):e38–360. doi:10.1161/cir.0000000000000350 [PubMed: 26673558]
3. Bergethon KE, Ju C, DeVore AD, et al. Trends in 30-Day Readmission Rates for Patients Hospitalized With Heart Failure: Findings From the Get With The Guidelines-Heart Failure Registry. Circ Heart Fail Jun 2016;9(6)doi:10.1161/circheartfailure.115.002594
4. Ponikowski P, Voors AA, Anker SD, et al. 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC)Developed with the special contribution of the Heart Failure Association (HFA) of the ESC. Eur Heart J. Jul 14 2016;37(27):2129–2200. doi:10.1093/eurheartj/ehw128 [PubMed: 27206819]
5. Riegel B, Dickson VV, Faulkner KM. The Situation-Specific Theory of Heart Failure Self-Care: Revised and Updated. J Cardiovasc Nurs May-Jun 2016;31(3):226–35. doi:10.1097/jcn.0000000000000244 [PubMed: 25774844]
6. Gorodeski EZ, Goyal P, Hummel SL, et al. Domain Management Approach to Heart Failure in the Geriatric Patient: Present and Future. J Am Coll Cardiol. May 1 2018;71(17):1921–1936. doi:10.1016/j.jacc.2018.02.059 [PubMed: 29699619]
7. Sterling MR, Jannat-Khah D, Bryan J, et al. The Prevalence of Cognitive Impairment Among Adults with Incident Heart Failure: The REasons for Geographic and Racial Differences in Stroke (REGARDS) Study. Journal of Cardiac Failure. doi:10.1016/j.cardfail.2018.12.006
8. Hammond CA, Blades NJ, Chaudhry SI, et al. Long-Term Cognitive Decline After Newly Diagnosed Heart Failure: Longitudinal Analysis in the CHS (Cardiovascular Health Study). Circ Heart Fail. Mar 2018;11(3):e004476. doi:10.1161/circheartfailure.117.004476 [PubMed: 29523517]
9. Murad K, Goff DC, Morgan TM, et al. Burden of Comorbidities and Functional and Cognitive Impairments in Elderly Patients at the Initial Diagnosis of Heart Failure and their Impact on Total Mortality. The Cardiovascular Health Study. JACC Heart Fail Jul 2015;3(7):542–50. doi:10.1016/j.jchf.2015.03.004 [PubMed: 26160370]
10. Sterling MR, Lin FR, Jannat-Khah DP, Goman AM, Echeverria SE, Safford MM. Hearing Loss Among Older Adults With Heart Failure in the United States: Data From the National Health and Nutrition Examination Survey. JAMA Otolaryngol Head Neck Surg Jan 25 2018;doi:10.1001/jamaoto.2017.2979
11. Sterling MR, Jannat-Khah D, Vitale S, Safford MM. Can your patients with heart failure see? The prevalence of visual impairment among adults with heart failure. J Gen Intern Med Feb 20 2018;doi:10.1007/s11606-018-4366-1
12. Nicholas Dionne-Odom J, Hooker SA, Bekelman D, et al. Family caregiving for persons with heart failure at the intersection of heart failure and palliative care: a state-of-the-science review. Heart Fail Rev Feb 04 2017;doi:10.1007/s10741-017-9597-4
13. Molloy GJ, Johnston DW, Witham MD. Family caregiving and congestive heart failure. Review and analysis. Eur J Heart Fail Jun 2005;7(4):592–603. doi:10.1016/j.ejheart.2004.07.008 [PubMed: 15921800]
14. Jones CD, Wald HL, Boxer RS, et al. Characteristics Associated with Home Health Care Referrals at Hospital Discharge: Results from the 2012 National Inpatient Sample. Health Serv Res. Apr 2017;52(2):879–894. doi:10.1111/1475-6773.12504 [PubMed: 27196526]
15. Sterling MR, Shaw AL, Leung PB, et al. Home care workers in heart failure: a systematic review. J Multidisciplinary Healthcare. 2018;11:481–492. doi:10.2147/JMDH.S175512
16. Sterling MR, Kern LM, Safford MM, et al. Home Health Care Use and Post-Discharge Outcomes After Heart Failure Hospitalizations. JACC Heart Fail Aug 12 2020;doi:10.1016/j.jchf.2020.06.009

17. National P. U. S. Home Care Workers: Key Facts (2017) - PHI. 2019.
18. Home Health Aides and Personal Care Aides. Available at https://www.bls.gov/ooh/healthcare/home-health-aides-and-personal-care-aides.htm Published 2016. Accessed September 1, 2020.
19. PHI. US Home Care Workers: Key Facts. https://phinational.org/sites/phinational.org/files/phi-home-care-workers-key-facts.pdf. Published 2016. Accessed September 26, 2017.
20. Bureau of Labor Statistics. Fastest growing occupations. https://www.bls.gov/emp/ep_table_103.htm. Published 2018. Updated April 11, 2018. Accessed May 1, 2018.
21. Reckrey JM, Tsui EK, Morrison RS, et al. Beyond Functional Support: The Range Of Health-Related Tasks Performed In The Home By Paid Caregivers In New York. Health Aff (Millwood). Jun 2019;38(6):927–933. doi:10.1377/hlthaff.2019.00004. [PubMed: 31158023]
22. Sterling MR, Silva AF, Leung PBK, et al. "It's Like They Forget That the Word 'Health' Is in 'Home Health Aide'": Understanding the Perspectives of Home Care Workers Who Care for Adults With Heart Failure. J Am Heart Assoc Dec 4 2018;7(23):e010134. doi:10.1161/jaha.118.010134 [PubMed: 30571599]
23. Vellone E, Riegel B, Alvaro R. A Situation-Specific Theory of Caregiver Contributions to Heart Failure Self-care. J Cardiovasc Nurs Mar/Apr 2019;34(2):166–173. doi:10.1097/jcn.0000000000000549 [PubMed: 30363017]
24. Archbold PG, Stewart BJ, Greenlick MR, Harvath T. Mutuality and preparedness as predictors of caregiver role strain. Res Nurs Health. Dec 1990;13(6):375–84. [PubMed: 2270302]
25. Park EO, Schumacher KL. The state of the science of family caregiver-care receiver mutuality: a systematic review. Nurs Inq. Jun 2014;21(2):140–52. doi:10.1111/nin.12032
26. Vellone E, Biagioli V, Durante A, et al. The Influence of Caregiver Preparedness on Caregiver Contributions to Self-care in Heart Failure and the Mediating Role of Caregiver Confidence. J Cardiovasc Nurs May/June 2020;35(3):243–252. doi:10.1097/jcn.0000000000000632 [PubMed: 32084078]
27. 1199 United Healthcare Workers East.
28. Home Care Industry Education Fund. About Us. April 25, 2017. https://www.1199seiuhomecareed.org/about/
29. Pucciarelli G, Savini S, Byun E, et al. Psychometric properties of the Caregiver Preparedness Scale in caregivers of stroke survivors. Heart Lung. Nov-Dec 2014;43(6):555–60. doi:10.1016/j.hrtlng.2014.08.004 [PubMed: 25239706]
30. Petruzzo A, Paturzo M, Buck HG, et al. Psychometric evaluation of the Caregiver Preparedness Scale in caregivers of adults with heart failure. Res Nurs Health Oct 2017;40(5):470–478. doi:10.1002/nur.21811 [PubMed: 28884832]
31. Dellafiore F, Buck HG, Pucciarelli G, et al. Psychometric characteristics of the mutuality scale in heart failure patients and caregivers. Heart Lung. Jun 7 2018;doi:10.1016/j.hrtlng.2018.05.018
32. Pucciarelli G, Buck HG, Barbaranelli C, et al. Psychometric Characteristics of the Mutuality Scale in Stroke Patients and Caregivers. Gerontologist Oct 2016;56(5):e89–98. doi:10.1093/geront/gnw083 [PubMed: 27114475]
33. Vellone E, Riegel B, Cocchieri A, et al. Validity and reliability of the caregiver contribution to self-care of heart failure index. J Cardiovasc Nurs. May-Jun 2013;28(3):245–55. doi:10.1097/JCN.0b013e318256385e [PubMed: 22760172]
34. Kline RB (2015). Principles and practice of structural equation modeling. NNewee York: Guilford Press.
35. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)--a metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform. Apr 2009;42(2):377–81. doi:10.1016/j.jbi.2008.08.010 [PubMed: 18929686]
36. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. J Clin Epidemiol Apr 2008;61(4):344–9. doi:10.1016/j.jclinepi.2007.11.008 [PubMed: 18313558]
37. Hoyle RH. Structural equation modeling: concepts, issues, and application. Thousands Oaks, CA Sage; 1995.

38. Tanaka JS. Multifaceted Conceptions of Fit. In: Kennet AB, Long JS, eds. Structural Equation Models Newbury Park, CA: Sage; 1993:10–39.
39. Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling. 1999;6:1–55.
40. Browne MW, Cudeck R. Alternative ways of assessing model fit. In: Bollen KA, S LJ, eds. Testing structural equation models. Newbury Park, CA: Sage; 1993:136–162.
41. Joreskog KG, Sorbom D. Lisrel VI. Analysis of linear structural relationships by maximum likelihood, intrumental variables, and least squares methods. Mooresville, Indiana: Scientific Software; 1984.
42. Fornell C, Larcker D. Evaluating Structural Equation Models with Unobservable Variable and Measurement Error. Journal of Marketing Research. 1981;18:39–50.
43. McDonald R Test Theory: A Unified Treatment. Mahwah, NJ: Lawrence Erlbaum Associates; 1999.
44. Bagozzi RP, Yi Y. Specification, evaluation, and interpretation of structural equation models. Journal of the academy of marketing science. 2012;40(1):8–34.
45. Coffman DL, MacCallum RC. Using Parcels to Convert Path Analysis Models Into Latent Variable Models. Multivariate Behavioral Research. 2005;40(2):235–259. [PubMed: 26760108]
46. Little TD, Cunningham WA, Shahar G, Widaman KF. To Parcel or Not to Parcel: Exploring the Question, Weighing the Merits. Structural Equation Modeling: A Multidisciplinary Journal. 2002;9(2):151–173.
47. Kishton JM, Widaman KF. Unidimensional versus domain representative parceling of questionnaire items: An empirical example. Educational and psychological measurement. 1994;54(3):757–765.
48. Dellafiore F, Paturzo M, Petruzzo A, et al. Validity and reliability of the mutuality scale in heart failure patient and caregiver dyads. European Heart Journal. 2017;38(1).
49. Bentler PM. Alpha, dimension-free, and model-based internal consistency reliability. Psychometrika. 2009;74:137–143. [PubMed: 20161430]
50. Riegel B, Lee CS, Dickson VV, Carlson B. An Update on the Self-Care of Heart Failure Index. J Cardiovasc Nurs Nov–Dec 2009;24(6):485–97. doi:10.1097/JCN.0b013e3181b4baa0 [PubMed: 19786884]
51. Vellone E, Riegel B, Cocchieri A, et al. Psychometric testing of the Self-Care of Heart Failure Index Version 6.2. Res Nurs Health. 2013;36(5):500–511. [PubMed: 23832431]
52. Bentler PM. EQS 6 Structural Equations Program Manual. Encino, CA: Multivariate Software, Inc; 2006.
53. Preacher KJ, & Coffman DL (2006, May). Computing power and minimum sample size for RMSEA [Computer software]. Available from http://quantpsy.org/54.
54. Sterling M, Dell N, Tseng E, et al. Home Care Workers Caring for Adults with Heart Failure Need Better Access to Training and Technology: A Role for Implementation Science. Journal of Clinical and Translational Science. 2020:1–15. doi:10.1017/cts.2020.36
55. Sterling MR, Dell N, Piantella B, et al. Understanding the Workflow of Home Health Care for Patients with Heart Failure: Challenges and Opportunities. J Gen Intern Med Feb 5 2020;doi:10.1007/s11606-020-05675-8
56. Durante A, Paturzo M, Mottola A, Alvaro R, Vaughan Dickson V, Vellone E. Caregiver Contribution to Self-care in Patients With Heart Failure: A Qualitative Descriptive Study. Journal of Cardiovascular Nursing. 9000;Publish Ahead of Print(P)doi:10.1097/jcn.0000000000000560
57. Hooker SA, Schmiege SJ, Trivedi RB, Amoyal NR, Bekelman DB. Mutuality and heart failure self-care in patients and their informal caregivers. European Journal of Cardiovascular Nursing : Journal of the Working Group on Cardiovascular Nursing of the European Society of Cardiology. 2018;17(2):102–113.

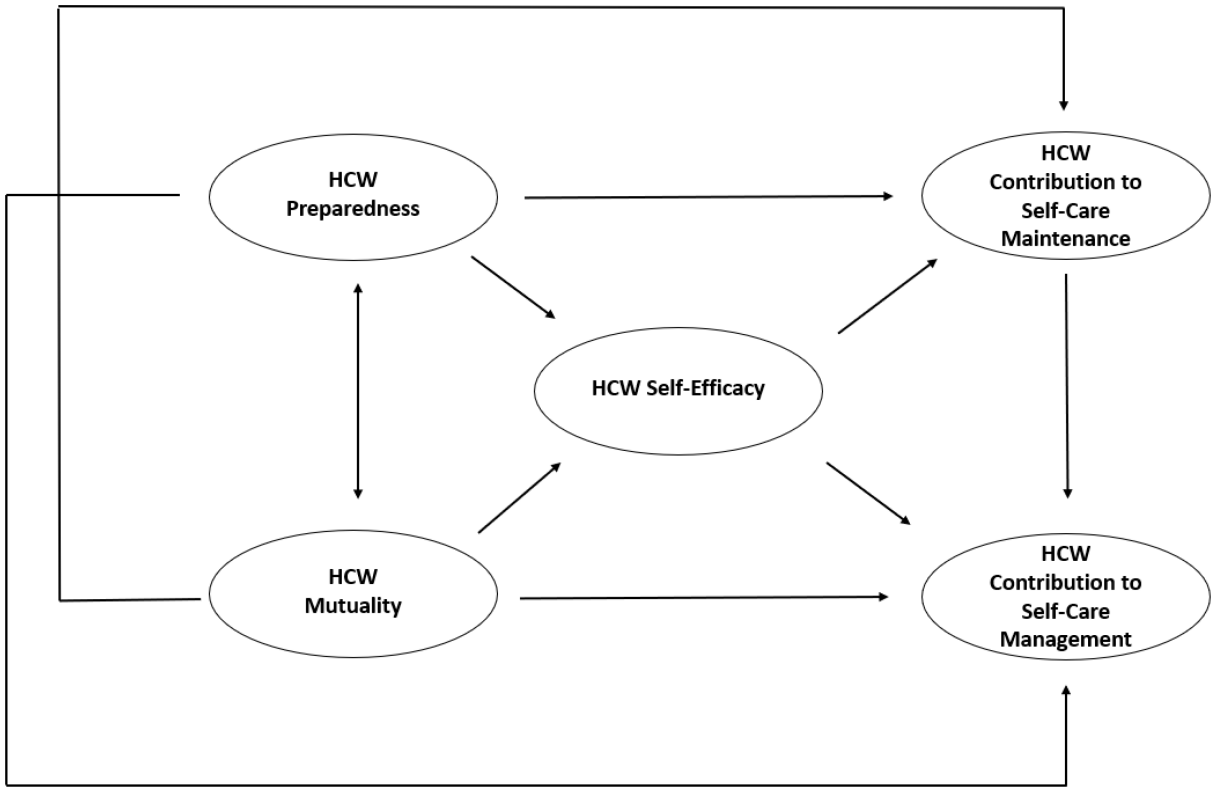
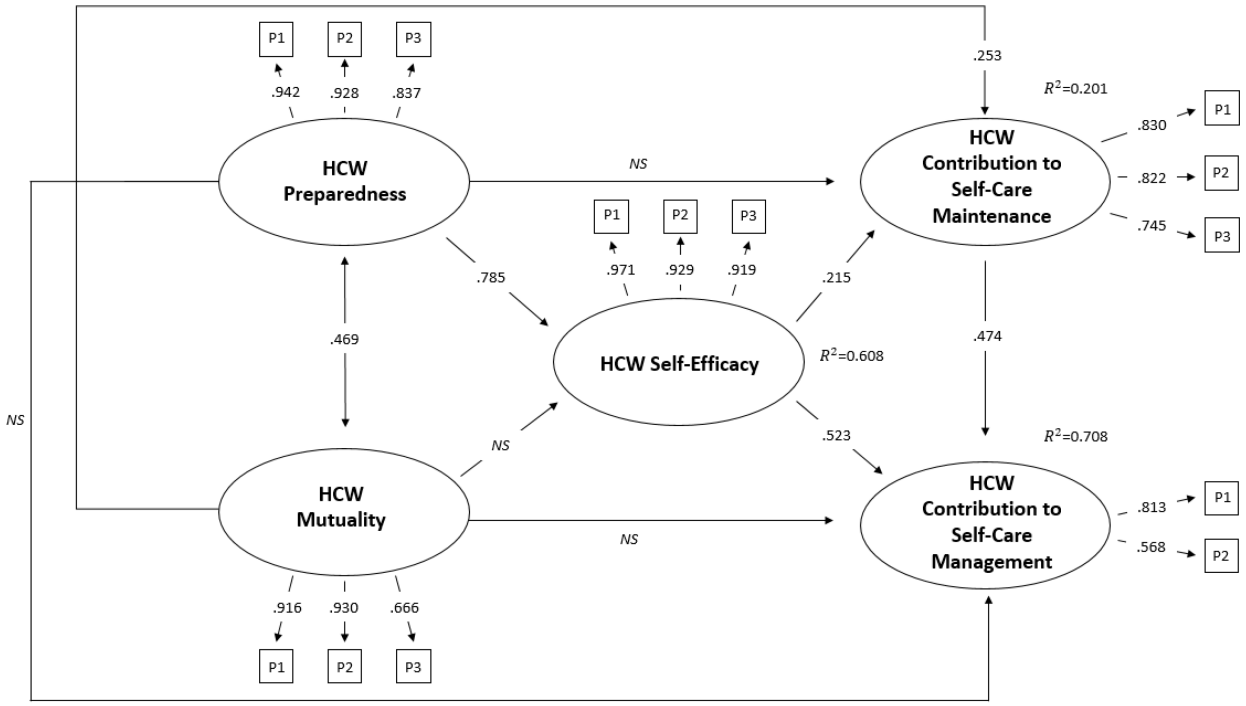


Figure 1.

Conceptual model guiding the relationships between home care workers' (HCWs) preparedness, mutuality, and caregiver contribution to heart failure (HF) patient self-care. Guided by The Situation-Specific Theory of Caregiver Contribution to Heart Failure (HF) Self-care, we hypothesized several relationships exist between home care workers' (HCWs) preparedness, mutuality, contribution to HF self-care and self-efficacy. The arrows (and their directionality) represent these possible relationships.



Abbreviations: HCW: home care worker; P: parcel; NS: non-significant

Figure 2.

Results of the structural equation modeling testing

The Structural Equation Model Testing between preparedness, mutuality, contribution to self-care maintenance and management, and self-efficacy. *Abbreviations: HCW: home care worker; P: parcel; NS: non-significant pathways*.

Table 1.

Characteristics of Home Care Workers (HCWs) Who Cared for Adults with Heart Failure (HF)

Characteristics (N = 317)	**N (%)**
Female	296 (94.0%)
Age (years), median (IQR)	50 (37, 57)
Race/Ethnicity	
Non-Hispanic White	38 (12.1%)
Non-Hispanic Black	134 (42.5%)
Hispanic	72 (22.9%)
Asian/Pacific Islander	15 (4.8%)
Other	56 (17.8%)
Highest level of education	
No degree or some high school	67 (21.5%)
Completed high school or GED	133 (42.8%)
Some college	49 (15.8%)
College degree	46 (14.8%)
Graduate degree	16 (5.1%)
Foreign (non-US) born	225 (71.2%)
Years worked as a home care worker, median (IQR)	8 (4, 16)
Number of patients cared for with HF	
1–5	225 (71.0%)
6–10	61 (19.2%)
11–15	18 (5.7%)
>15	13 (4.1%)
Hours per week spent with HF patient, median (IQR)	20 (8, 36)
Prior HF training	
None	123 (38.8%)
A little	85 (26.8%)
Some	87 (27.4%)
A lot	22 (6.9%)
Caregiving Preparation Scale (CPS), mean (SD)	3.86 (0.93)
Mutuality Scale (MS), mean (SD)	3.87 (0.76)
Caregiver Contribution to Self-Care of Heart Failure Index (CC-SCHFI)	
Maintenance scale, mean (SD)	72.98 (17.87)
Maintenance scale ≥ 70 (adequate)	202 (63.7%)
Management scale, mean (SD)	58.81 (20.28)
Management scale ≥ 70 (adequate)	111 (35.1%)
Caregiver Self-Efficacy in Contributing to Self-Care Scale	
Self-efficacy, mean (SD)	58.97 (28.53)
Self-efficacy ≥ 70 (adequate)	133 (42.0%)

Abbreviations: IQR - Interquartile range; HF = Heart Failure; HCW=Home care worker

22 agencies are represented in sample (15 small, 3 medium, 4 large)

Variables with missing values include gender (n= 2), age (n=18) , race/ethnicity (n=10), education (n=6), not born in US (n=1), years as home care worker (n=3), hours a week spend with HF patient (n=23), mutuality scale (n=125) , preparation for caregiving (n=15), Maintenance subscale (n=4), management subscale (n=2), monitoring subscale (n= 5)

Table 2.

Confirmatory Factor Analysis for the Caregiver Preparedness Scale (CPS) and the Mutuality Scale (MS)

Caregiver Preparedness Scale (CPS)	**Factor loadings**	**Item mean (SD)**	**Skewness**	**Kur-tosis**
1. How well prepared do you think you are to take care of a person's physical needs	0.76	4.03 (0.98)	− 0.69	−0.51
2. How well prepared do you think you are to take care of his or her emotional needs	0.71	3.88 (0.99)	−0.46	−0.68
3. How well prepared do you think you are to find out about and set up services for him/her	0.80	3.68 (1.29)	−0.54	−0.99
4. How well prepared do you think you are for the stress of caregiving	0.85	3.91 (1.04)	−0.63	−0.59
5. How well prepared do you think you are to make caregiving activities pleasant for both you and your family member?	0.70	4.29 (0.88)	−1.17	0.87
6. How well prepared do you think you are to respond to and handle emergencies that involve him or her?	0.72	3.52 (1.51)	−0.48	−1.30
7. How well prepared do you think you are to get help and information you need from the health care system?	0.67	3.40 (1.57)	−0.42	−1.40
8. Overall, how well prepared do you think you are to care for your family member?	0.79	4.29 (0.94)	−1.13	0.28
Mutuality Scale (MS)	**Intended Factor Loading** †			
Love, shared pleasurable activities and values				
2. How close do you feel to him or her?	0.77	4.16 (0.87)	−0.89	0.33
5. How attached are you to him or her?	0.75	3.94 (0.94)	−0.76	0.24
8. How much love do you feel for him or her?	0.57 (0.26)	4.07 (0.95)	−0.90	0.38
3. How much do you enjoy sharing the past experiences with him or her?	0.67	4.02 (1.08)	−0.96	0.22
7. How much do you like to sit and talk to him or her?	0.76	4,30 (0.89)	−1.40	1.74
11. How much do the two of you laugh together?	0.71	4.21 (0.91)	−1.16	1.14
14. To what extent do you enjoy the time the two of you spend together?	0.58 (0.18)	4.15 (0.95)	−1.21	1.22
1.To what extent do the two of you see eye to eye (agree on things)?	0.70	4.00 (0.89)	−0.66	−0.08
9. To what extent do the two of you share the same values?	0.49 (0.29)	3.63 (1.08)	−0.62	−0.07
4. How much does he or she express feelings of appreciation for you and the things you do?	0.72 (0.00)	4.23 (1.00)	−1.32	1.08
6. How much does he or she help you?	0.39 (0.32)	3.52 (1.18)	−0.47	−0.64
10. When you really need it, how much does he or she comfort you?	0.62 (0.18)	3.46 (1.25)	−0.501	−0.76
Reciprocity				
12. How much do you confide in him or her?	0.83	3.33 (1.33)	−0.36	−1.02
13. How much emotional support does he or she give to you?	0.90	3.34 (1.31)	−0.35	−0.94
15. How often does he or she express feelings of warmth toward you?	0.53 (0.28)	3.98 (1.06)	−0.96	0.28

Note.

† The cross-loading is within parenthesis

Table 3.

Confirmatory Factor Analysis (CFA) of the Caregiver Contribution to Self-Care of HF Index (CC-SCHFI) scales and Caregiver Self-Efficacy Scale

Self-Care Maintenance Scale	**Factor loadings**	**Item mean (SD)**	**Skew-ness**	**Kur-tosis**
Symptom Monitoring				
1. To check the weight?	0.61	2.60 (0.99)	−0.06	−1.07
2. To check the ankles for swelling?	0.89	3.22 (0.88)	−0.92	0.01
3. To try to avoid getting sick (e.g., flu shot, avoid ill people)?	0.45	3.35 (0.86)	−1.23	0.74
Physical Activity				
4. To do some physical activity?	0.71	2.86 (0.88)	−0.23	−0.81
7. To exercise for 30 minutes?	0.84	2.69 (1.00)	−0.03	−1.17
Sodium intake				
6. To eat a low salt diet?	0.79	3,41 (0.83)	−1.20	0.36
9. To ask for low salt items when eating out or visiting others?	0.87	3.58 (0.78)	−1.95	3.08
Medical Treatment Adherence				
5. To keep doctor or nurse appointments?	0.53	3.55 (0.72)	−1.77	3.13
8. To not forget to take medicine?	0.82	3.67 (0.74)	−2.42	5.32
10. To use a system (pill box, reminders) to help you remember your medicines?	0.83	3.58 (0.78)	−1.95	3.08
Self-Care Management Scale				
11. If the person you care for has/had trouble breathing or ankle swelling in the past month… how quickly did you recognize it as a symptom of heart failure?	0.46	2.48 (1.25)	−0.42	−0.87
12. To reduce the salt in the diet	0.90	3.28 (0.91)	−0.95	−0.26
13. To reduce fluid intake	0.71	2.77 (1.02)	−0.36	−0.99
14. To take an extra water pill	0.54	1.88 (1.14)	0.81	−0.94
15. To call the doctor or nurse for guidance	0.42	3.53 (0.83)	−1.79	2.35
16. How sure were you that the remedy helped or did not help?	0.38	2.01 (1.26)	−1.79	2.35
Caregiver Self-Efficacy in contributing to self-care scale				
Self-efficacy in maintenance and monitoring				
1. Keep him/her stable and free of symptoms?	0.88	3.13 (1.33)	0.04	−1.15
2. Follow the treatment plan you have been given?	0.80	3.91 (1.21)	−0.73	−0.71
3. Persist in following the treatment plan even when difficult?	0.94	3.15 (1.53)	−0.14	−1.48
4. Monitor his/her condition routinely?	0.93	3.65 (1.28)	−0.36	−1.23
5. Persist in routinely monitoring his/her condition even when difficult?	0.96	3.16 (1.58)	−0.14	−1.54
6. Recognize changes in his/her health if they occur?	0.81	3.74 (1.15)	−0.36	−1.06
Self-Efficacy in management				
7. Evaluate the importance of his/her symptoms?	0.91	3.62 (1.19)	−0.33	−1.03
8. Do something to relieve his/her symptoms?	0.88	3.22 (1.34)	−0.11	−1.18
9. Persist in finding a remedy for his/her symptoms even when difficult?	0.94	2.86 (1.57)	0.10	−1.54
10. Evaluate how well a remedy works?	0.87	3.24 (1.34)	−0.18	−1.19

Table 4.

Mediation Analysis

Indirect effects	Estimate	S.E.	Est./S.E.	P value
Effects from MS score to CC-SCHFI self-care management scale				
Specific indirect MS --> CC-SCHFI self-care maintenance scale --> --> CC-SCHFI self-care management scale	0.13	0.06	2.26	0.02
Effects from CPS to CC-SCHFI self-care management scale				
Specific indirect CPS --> Caregiver Self-Efficacy --> CC-SCHFI self-care management scale	0.31	0.04	7.73	0.00
Specific indirect CPS --> Caregiver Self-Efficacy --> CC-SCHFI self-care maintenance scale --> CC-SCHFI self-care management scale	0.06	0.03	2.03	0.04
Effects from Caregiver Self-Efficacy to CC-SCHFI self-care management scale				
Specific indirect Caregiver Self-Efficacy --> CC-SCHFI self-care maintenance scale --> CC-SCHFI self-care management scale	0.06	0.03	2.05	0.04
Effects from CPS to CC-SCHFI self-care maintenance				
Specific indirect 1 CPS --> Caregiver Self-Efficacy --> CC-SCHFI self-care maintenance scale	0.09	0.04	2.02	0.04

Note. Only significant paths have been reported.

Abbreviations: CPS: Caregiver Preparedness Scale; MS: Mutuality Scale; CC-SCHFI: Caregiver Contribution to Self-Care in Heart Failure Index