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Person with Heart Failure and Care Partner Dyads: Current Knowledge, Challenges, and Future Directions: State-of-the-Art Review

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Abstract

Over the past decade, there has been substantial growth in heart failure (HF) research that focuses on persons with HF and their care partners (family members or other close friends that provide unpaid support) as an interdependent team, or "care dyad." In this state-of-the-art review, we use a dyadic lens to identify and summarize current research on HF care dyads, from qualitative studies, to non-experimental quantitative studies, to randomized-controlled trials. Although much work has been done, this literature is younger and less well-developed than care dyad literatures from other conditions (e.g., cancer, Alzheimer's disease). We discuss the substantial challenges and limitations in this body of work, with an eye towards addressing common issues that impact rigor. We also look towards future directions, and discuss the promise dyadic research holds for improving patient, care partner, and relationship health.\

Graphical Abstract

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The authors declare no conflicts of interest.

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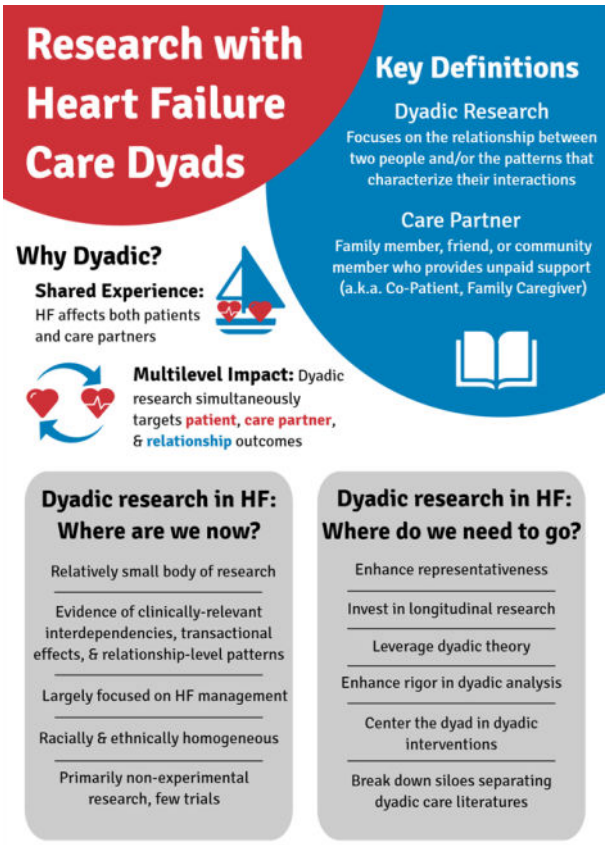

Lay Summary:

- The goal of dyadic research is to understand and support the health of two people – patient and care partner – on two levels – individual and relational.
- The body of dyadic literature in heart failure is developing and still relatively small, but it provides evidence that patients and care partners share the experience of heart failure and influence each other's health in important ways.
- Key opportunities for advancing this literature include increasing representativeness, investing in longitudinal research, utilizing dyadic theories, enhancing rigor in measurement and analysis, and maximizing relationship-centered designs.

Heart failure care partners (a.k.a. "family caregivers" or "co-patients") play an important role in heart failure management. Dyadic research in heart failure uses a relationship lens to examine how patients and care partners interact as an interdependent "team." This state-of-the-art review summarizes the HF care dyad literature, discusses challenges, and highlights future directions. Although there is evidence of clinically-relevant relational effects, this is a developing science, with few trials, limited sample diversity, and a near-singular focus on heart failure self-care. Opportunities exist to advance the impact of dyadic heart failure research to better support patient, care partner, and relationship outcomes.

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Keywords

heart failure; caregivers; care partners; dyadic

Introduction

As home management of heart failure (HF) has increased in intensity and complexity, a growing body of work includes HF care partners.[1] Care partners are family members or other friends/community members (i.e., fictive kin) that provide unpaid support. “Family caregivers” is a common alternative term, but “care partner” is used throughout this paper to reflect a shared partnership in care,[2] in which the person living with HF and their care partner share the experience and care of HF. This partnership is a more typical approximation of HF home management than the “caregiver-care recipient” dynamic, which suggests a unidirectional relationship with one person giving care and the other passively receiving it. Commonly, family care researchers in HF either focus on care partners alone, or include persons with HF but examine their experiences and outcomes separately. Comparatively less of HF research involving care partners is *dyadic*, i.e., focusing on how the person with HF and their care partner live and manage HF together as a team.

For this review we use the relationship-centered conceptualization of *dyadic* proposed by Thompson and Walker.[3] In brief, simply obtaining information on both dyad members does not yield dyadic research. Rather, dyadic research must focus on the interpersonal relationship between two people and/or the patterns that characterize their interactions. The dyad must be the “unit of analysis” across all stages of the research, from development of the research question onward. Data and analyses must be relational in some way (e.g., parallel measures or constructs and explicit focus on interdependencies, transactions, patterns, etc.), and the implications of the research must be at the level of the dyad. In this state-of-the-art review, we use this dyadic lens to identify and summarize current knowledge in the HF care dyad literature, discuss challenges, and highlight future directions. Our hope is to promote better understanding of the science underpinning how HF care partnerships function, what they may need to be successful, and how we might intervene to optimize both individual and relationship outcomes.

Current Knowledge

In this section summarizing current knowledge, we begin with an overview of who is (and is not) represented in this literature, followed by three sections summarizing findings from qualitative/mixed-methods studies, non-experimental quantitative studies, and randomized-controlled trials. A brief description of search methods and a full evidence table of studies can be found in the Appendix.

What Types of Dyads Have Been Studied in Heart Failure?

Major characteristics of the 5,892 dyads studied in the context of HF are presented in Figure 1. The predominant relationship types represented were spousal/partnered dyads or parent/adult child dyads, which together made up approximately two-thirds of the dyads.

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We have limited insight on the remaining third, who were typically categorized as “other” or for whom no relationship type was reported. Within studies, samples ranged from being 100% cohabitating spouse/partner dyads to 100% non-spousal with all care partners living outside of the household. The average ages of persons with HF and their care partners were 67.5±11.3 years and 58.6±13.0 years, respectively, with variability in age likely a function of variability in relationship types represented. Differences in age between persons with HF and their care partners within studies ranged from nearly +30 years (commonly older persons with HF paired with adult children) to −5 years (slightly older care partners as compared the person with HF).

Most dyads were comprised of male patients and female care partners, with care partner gender unreported in nearly 7% of dyads. Cumulatively, there was limited-to-no mention of non-heteronormative relationships or persons identifying as non-binary with respect to gender. As such, the world’s evidence on HF dyads is globally hetero-normative and gender conforming. Race was not reported for over half of persons with HF and nearly 75% of care partners, and very few studies report ethnicity for either dyad member. Among studies that reported race, nearly 75% of dyads were comprised of White patients and White care partners. There was severely limited inclusion of persons with HF or care partners who identify as other than White, African American, or Asian American. Of note, much of the literature is from European nations, wherein it is less common to report on race/ethnicity.

A plurality (46.9%) of dyads involved a patient with New York Heart Association (NYHA) class III/IV HF; however, HF severity was not reported in nearly one-fifth of cases, and there was substantial variability between individual studies, with sample HF severity ranging from 100% of patients with advanced HF with implanted left ventricular assist devices, to 80% of patients with NYHA class I/II. Overall, there was very limited information on HF etiology or type.

What Hypothesis-Generating Insights Have Been Gained from Qualitative and Mixed-Methods Studies?

The focus of the qualitative and mixed-methods literature on HF care dyads is primarily on aspects of HF management that occur at home. Some investigators examine how patient and care partners engage in HF management together[4–7] and what their care needs are as a dyad.[8] Others focus on intradyadic dynamics of HF home management, and whether patients and their care partners agree about how they experience or manage HF together (e.g., how they organize HF care, cope with illness together, perceive the future).[7, 9–12] Some investigators also examine psychological or relational distress in the dyad in relation to HF management.[6, 9–12]

Despite its relatively singular focus on the dyadic experience of managing HF, qualitative and mixed-methods research on HF dyads is theoretically and methodologically heterogeneous. Some researchers cite no particular theory, while others base aims or components (e.g., interview guides) on differing theoretical frameworks. Varied theoretical perspectives allow for dyads’ experiences of HF management to be understood from different lenses, however, adaptations of individual-level theories are common, which may limit dyadic perspective. While most have qualitative descriptive designs, data collection and

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analytic approaches vary. Dyad members are interviewed separately in some studies,[7, 9, 11] jointly (or in larger focus groups) in other studies,[4, 5, 8] and sometimes both separately and together.[6, 10, 12] The methodological choice between separate or joint interviews is important, as each type of approach has different benefits, drawbacks, and implications for interpreting data.[13, 14] Similarly, analytic choices have important implications, and there are multiple ways to approach data derived from two individuals and their associated interactions. Approaches to analyzing data with the dyad as a unit of analysis differ across qualitative studies in HF or, more commonly, are not clearly described.

Amidst theoretical and methodological differences, similar hypothesis-generating insights emerge. First, how dyads share the experience and management of HF is important for both disease management and person-centered outcomes. Liljeroos and colleagues[8] found that couples perceived a need to share the burden of HF with each other and with other dyads. Dyads also wanted shared HF education (i.e., provided to the dyad together) and joint psychosocial support, as HF affected them both.[8] Sharing HF care was also a major focus in the development of the Heart Failure Care Dyadic Typology by Buck and colleagues,[15] where dyads were classified into patterns of shared HF management based on conceptual and empirical studies of dyadic illness management, illustrated by case examples.[7] This typology has since been used to classify HF care dyads in other mixed-methods[10] and quantitative work.[16]

Patterns in sharing the experience of HF management have also been a focus in other studies. For example, Retrum and colleagues[9] interviewed dyad members separately, examining how they talked about their shared experience managing HF, including challenges, coping and future planning. Some dyads shared similar perspectives on how they managed daily challenges and stresses of living with HF, and discussed future planning and end-of-life in similar ways. Others had discordant perspectives on how they approached illness management, the future, and advanced care planning. Importantly, discordant perspectives were associated with greater tension or distress in one or both dyad members. Similarly, in a large qualitative study of dyadic palliative care needs, Kitko and colleagues[11] found conflicting perspectives not only on illness management, but also on broader health care issues and end-of-life decisions in nearly half of dyads. Again, dyads with conflicting perspectives reported more tension and distress than other dyads.[11]

Another valuable insight is that relationship dynamics seem to be important to dyads' experience with HF. Buck and colleagues found that dyads defaulted to long-standing relationship patterns in HF management, preventing them from responding to changes in HF.[4, 5] In another study, dyads described how stress and uncertainty of living with HF caused new relationship conflicts and communication difficulties.[8] In other work, shared relationships and shared activities ("sharing life") were found to be central to patients and partners regardless of how they managed HF in their relationship, and when HF worsened, losing shared activities caused distress.[7] Kim and colleagues[6] found that patients and care partners felt that HF management tasks intruded on their relationship, and that the quality of their relationship was an important source of motivation for both managing HF and keeping them focused on aspects of life beyond HF.[6] If a dyad described their relationship as close, with love as the primary motivation for caring, they reported better success with

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HF management and better quality of life (QOL).[12] In terms of relationship type differences, Retrum and colleagues found more emotional investment and sense of responsibility among spousal vs. adult-child dyads, whereas adult-child dyads experienced greater struggles with HF-related physical decline.[9]

Collectively, there is substantial qualitative and mixed-methods work to suggest that how dyads share the experience and management of HF matters. Whether or not their perspectives agree seems to be important, with congruent perspectives having protective effects and incongruence contributing to distress. Further, the dyad's pre-existing relationship is important. Relationship dynamics before illness, and likely relationship type, influences how they experience and manage HF, and reciprocally, HF can influence their relationship, resulting in the loss of things that were treasured (shared activities) and the addition of things that are unwanted (conflict, communication difficulty).

What Have We Learned from Non-Experimental Quantitative Studies?

The majority of studies involving HF care dyads utilize non-experimental quantitative designs. This section summarizes what is known from these studies, ranging from tests of simple transactional effects and interdependencies, to findings from more complex dyadic models (both multivariate and univariate) and typology work.

Simple Transactional Effects—There are several examples of individual-level factors of one member of a HF dyad influencing an individual-level factor of the other (Table 1; Figure 2A). In a traditional sense, such studies are not dyadic because the dyad is not the unit of analysis.[3] But, individual-level studies can provide valuable insight into the influence that one dyad member has on the other. Although transactional effects in HF dyads have involved a variety of outcomes (e.g., HF clinical events, engagement in HF management, health status), transactions involving care partner mental health are commonly-observed effects. For example, care partner stress and mental health have been significantly associated with important clinical endpoints, such as patient event-free survival and hospitalizations.[17–19] Transactional effects have also been observed between care partner stress (including physiological stress biomarkers) and indicators of patient HF severity, e.g., NYHA Class, symptom burden.[20–23]

Interdependencies and Shared Appraisal—There are several areas of established interdependencies within HF dyads in domains of mental and physical health, appraisal of relationship, appraisal of patient signs/symptoms and function, contributions to HF self-care, and decision-making regarding treatment (Table 2; Figure 2B). Interdependencies are important not only because they tell us something about dyadic interactions, but because they help us understand whether it makes more sense to conceptualize and study something in a dyadic versus individual framework.

Mental and Physical Health: In an early study, there were no differences in depressive symptoms or anxiety between persons with HF and their care partners.[24] Since that time, significant associations have been found in general mental health,[18, 25, 26] mental QOL,[27–30] emotional symptoms,[31, 32] depression,[29, 33–35] and anxiety[33] between persons with HF and

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their care partners. Although there is evidence of significant associations in physical health between persons with HF and their care partners,[25] physical QOL[26–30] and sleep[25, 30] are not consistently associated.

Appraisal of Relationship: There are well-characterized similarities in how persons with HF and their care partners appraise their relationship. Specifically, there are strong correlations between how patients and their care partners perceive communication, reciprocity, and decision-making,[28, 35, 36] as well as relationship satisfaction and mutuality.[28, 33–35, 37, 38]

Appraisal of Heart Failure Symptoms: Persons with HF and their care partners tend to rate signs like edema most similarly, and less visible symptoms (e.g., abdominal bloating, palpitations) less similarly.[39, 40] Appraisals of patient functional limitations are highly correlated,[34] and persons with HF and their care partners also have similar appraisals of patient fatigue, pain interference and anxiety.[41] Interestingly, appraisals of patient dyspnea are dissimilar.[41]

Contributions to Heart Failure Care and Decision-Making: Contributions that persons with HF and their care partners make to HF care are significantly correlated in the domains of self-care maintenance and self-care management.[27] Confidence/self-efficacy in contributions to HF care are also significantly correlated between persons with HF and their care partners.[27] Regarding advanced directives, there is poor-to-fair agreement between patient and care partners about aggressive treatments, and moderate agreement about hospice care in general.[42] Perceptions of decisional conflict (uncertainty over which course of action to take) in LVAD implantation are also highly correlated.[43]

Multivariate Outcomes Models—Beyond simple interdependencies, additional research has been done in HF using multivariate outcomes (a.k.a. matched pairs) models to examine predictors of a common outcome for each member of the dyad (e.g., patient and care partner depression).[44] Using this approach, investigators can quantify and adjust for the degree of interdependence in outcomes between dyad members, as well as test actor effects (influencing one's own outcome) and partner effects (influencing the outcome of the other dyad member). The specific approaches most commonly used are the Actor-Partner Interdependence Model (APIM)[45] and dyadic multilevel modeling.[46] Importantly, although a rigorous approach to selecting measures is imperative in any dyadic design or analysis,[47] a key prerequisite for analysis with APIM or dyadic multilevel modeling is parallel measurement. For example, if the outcome of the model is depression, then both patient depression and care partner depression should be measured using the same instrument. The APIM framework typically assumes parallel measurement for both the predictor and outcome variables, while dyadic multilevel modeling assumes that the outcome variables at minimum are measured in-parallel (the need for parallel measurement of other variables is dependent on the research question).

Actor-Partner Interdependence Models: The Actor-Partner Interdependence Model (APIM) developed by Kenny and colleagues[45] is the most widely-used model for quantifying dyadic interactions. A data example illustrating the basic structure of the APIM

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is presented in Figure 3. In the APIM framework, each dyad member contributes their own predictor variable and their own outcome variable to the model, from which actor effects and partner effects are estimated (adjusting for dyad interdependence). The model can be estimated using different statistical approaches (i.e., structural equation modeling, multilevel modeling), and has extensions for longitudinal analyses, moderation/mediation, and the addition of confounders.[48]

Although actor effects are important, partner effects are of the most interest, as they represent the transactional and shared nature of health within the dyad. Tested partner effects from APIMs in HF dyads (n=73 total APIMs) are presented in Table 3. Of the 73 tested partner effects wherein a patient predictor was tested in relation to a care partner outcome, only four (5.5%) have been statistically significant. Some examples include: greater patient-perceived relationship closeness predicting more care partner engagement in HF management[49] and better patient HF management predicting better care partner mental health.[33] Of the 73 tested partner effects wherein a care partner predictor was tested in relation to a patient outcome, 23 (31.5%) have been statistically significant. Some examples include: care partner affective symptoms (e.g., depression, anxiety) predicting worse patient QOL[24, 31] and worse patient HF management,[37] and greater care partner-perceived relationship closeness predicting better patient HF management.[49]

Dyadic Multilevel Modeling: Another type of multivariate outcomes model used in care dyad research is the multivariate parameterization of the dyadic multilevel model, developed by Sayer and colleagues.[44] Like the APIM, these models provide within- and between-dyad estimates of individual patient and care partner outcomes that have been measured in-parallel, while controlling for interdependence and measurement error. This model has similar limitations to the APIM, and can be used to examine actor and partner effects. However, it can also be used more flexibly, e.g., to test hypotheses beyond a single set of actor-partner effects or answer research questions centered on relationship-level determinants.

There are examples of multilevel dyadic models focusing on dimensions of HF self-care, and others focusing on psychological symptoms or health-related quality of life (HRQOL). In one study, better dyad relationship quality was associated with higher patient and care partner self-efficacy (a.k.a. confidence) in HF self-care.[50] In another study, better relationship quality was associated with better patient and care partner engagement in HF self-care behaviors, and other predictors of patient and/or care partner self-care were also observed, such as patient and care partner HRQOL and dyad relationship type.[51] In a study of patient and care partner congruence and satisfaction with how HF self-care is organized within their relationship, greater congruence and satisfaction was associated with better HRQOL for both dyad members.[52] Lastly, in a study of depressive symptoms, better patient self-care was associated with lower care partner depressive symptoms, and, conversely, better care partner engagement in self-care was associated with lower patient depressive symptoms.[53]

Univariate Outcomes Models—In some studies of HF dyads, univariate outcomes models have been used to generate Bayesian estimates of dyadic average (i.e., average

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score within the dyad on a particular outcome variable, measured using identical or parallel instruments in both the patient and their care partner) and dyadic incongruence (i.e. the magnitude and direction of the gap or difference between patient and care partner scores).[44] An alternative parameterization of the dyadic multilevel multivariate outcomes model (described in the previous section) is often used to model these estimates of dyadic average and incongruence, adjusting for dyadic interdependence and measurement error,[44] as the example in Figure 4. In dyadic research, creating relationship-level scores is one way of generating *second-order* variables.[3]

For example, in a univariate outcome study introducing the new concept of dyad-level confidence in HF self-care, greater average confidence within the dyad was associated with better patient self-care on multiple dimensions.[54] Greater incongruence within the dyad on confidence scores was associated with care partners contributing less to self-care. The direction of incongruence was also important: when care partners' rating of confidence was higher than the patient, they contributed more to HF maintenance (e.g., providing support with behaviors like medication adherence, reducing sodium intake), and the person with HF engaged less in consulting behaviors (e.g., contacting a provider for worsening HF).[54] There are also other examples of univariate outcomes models in dyadic HF research wherein the modeled dyadic average and/or incongruence scores are utilized to identify common patterns or typologies in how dyads manage or experience HF.[41, 55, 56]

Quantitative HF Dyadic Typologies

Characteristics and interactions within and between HF dyads are generally characterized by substantial variability. Dyadic typologies are a useful tool for organizing this variability into understandable, clinically meaningful patterns. In addition to the theoretically-derived and qualitatively validated Heart Failure Care Dyadic Typology,[15] there are examples of investigators creating dyadic configurations using within-dyad individual characteristics chosen a priori.[29, 57] There are also examples in which quantitative methods are used to identify dyad-level patterns empirically from the sample data, either from second-order factors extracted from univariate outcomes models, or from other individual- or dyad-level variables that characterize some key aspect of their relationship, as presented in Table 4. Each typology informs a different facet of shared HF management (e.g., shared knowledge, ability to assess symptoms, other aspects of disease management) or relationship dynamics (e.g., mutuality, closeness, communication), and each typology is also connected to meaningful individual- or dyad-level outcomes. Taken together, typologies uncover the diversity of care dyad relationships and illuminate what different dyads may need, informing precision interventions.

What Have We Learned from Randomized Controlled Trials?

Dyadic interventions aimed at improving HF self-care were systematically reviewed previously by Buck and colleagues.[58] In brief, the dyadic intervention literature in HF is small and heterogeneous, results are mixed, and significant methodological limitations exist across the entire body of research. Salient design elements and results of major HF dyadic trials over the last decade are presented in Table 5. Trials varied substantively in terms

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of design, behavioral change technique, mode of delivery, intervention dose, and primary outcomes, precluding synthesis of key features.

While all trials reported some positive intervention effects, results were mixed, with most trials reporting more null than positive results on one or more outcomes. Further, heterogeneity of interventions and outcomes (>20) across studies make it impossible to aggregate findings in a meaningful way. However, there were six outcomes common to three or more trials: *Self-care* of HF was a main outcome in four trials,[59–63] with one trial having overall positive results, two trials having mixed results (e.g., significant differences at some time points but not others), and one trial with null results. *Perceived control* of HF was a main outcome in three trials,[59, 64, 65] all of which had mixed results. *Depression* (or depressive symptoms) was a main outcome in four trials,[59, 61, 64, 65] in which all but one had null results. Results related to *care strain*, a main outcome in three trials,[59, 61, 65] were also mixed, with two null and one positive trial. Quality of life was also a common outcome: two trials with *HF-specific QOL* as a main outcome were positive and null,[62, 63] respectively, and the three trials with *general HRQOL* as a main outcome were all null.[59, 63, 64]

Some common limitations of these trials have particularly detrimental implications for capacity to detect significant effects. Foremost is small sample size (median N = 108 dyads), paired with relatively small intervention dose, with most delivering the majority of the intervention in 2 – 4 sessions, lasting < 2 hours (typically 1 hour or less) per session. These limitations, alongside the selection of endpoints that are relatively stable or not easily changed (e.g., HRQOL, depression), difficult to master (e.g., HF self-care), or without clear theoretical or mechanistic rationale, may partly explain mixed or null effects. There are also key endpoints that are missing that may change in a dyadic intervention, namely, relationship-level endpoints with protective effects like relationship quality or communication. Notably, only one study had a relationship-level endpoint (i.e., communication), and study investigators reported significant improvements for that endpoint in the intervention versus control.[61, 62] Additionally, there are no dyad-level analyses: all trials involve separate analyses of outcomes for patients and care partners as individual groups.

Major Challenges and Future Directions

While dyadic HF research has made important contributions to knowledge and clinical care, there are several challenges that have limited its impact. In the spirit of advancing this area of science, we present some of its foremost challenges for consideration as future directions.

Enhance Representativeness

Arguably the most important challenge in HF dyadic research is our near-complete lack of insight on the experiences and needs of dyads with multicultural or LGBTQ+ identities. With few exceptions, samples are overwhelmingly White/non-Hispanic, and there are essentially no studies that include persons identifying as non-binary or LGBTQ+. For an area of science with *relationship* dynamics at its center – often coupled relationships – studying exclusively hetero-normative relationships is a critical gap. And overall, lack of racial/ethnic and socioeconomic diversity is an unacceptable source of bias at

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best, and at worst, a fatal flaw. Broader caregiving literature has uncovered meaningful differences in how diverse families approach managing chronic illness, with families from underrepresented racial/ethnic groups often hesitating to engage formal services and instead relying on each other, putting strain on family relationships.[66] Given systemic inequities that place a disproportionate burden of health disparities on racial/ethnic and sexual/gender minority populations,[67, 68] calls to action to increase diversity in HF research must extend to research with care dyads. While we have an opportunity to learn from investigators in HF that have successfully recruited diverse samples of HF dyads,[60] we can also gain insight from broader literatures, particularly dementia caregiving, where investigators have been working on solutions for increasing representation of diverse caregivers for decades.[69–71]

Invest in Life-Course and Trajectory Research

Lack of longitudinal and life-course research is a major field-limiting gap in HF caregiving research,[1] and this dearth of knowledge extends to care dyad research. This is particularly problematic given advances in therapies allowing congenital heart patients to live longer, and also the younger average age of persons with certain HF etiologies (e.g., pregnancy-induced, substance use, chemotherapy-induced), where dyads may be couples in early- or middle-adulthood managing chronic, life-threatening HF while also caring for young children and/or aging parents. Further, given that one-fifth of dyadic HF studies do not report HF severity, almost no studies report etiology or type, and we have almost no longitudinal research, we know little about how the HF clinical course impacts care dyads over time. We cannot adequately support patients and partners if we only have insight on late-middle/late adulthood, and essentially no understanding of how needs change with the HF trajectory.

Understand and Leverage Dyadic Theory

Many dyadic studies in HF either cite no guiding theory, or adapt individual-level theories. Using dyadic theory brings greater consistency to dyadic conceptualization, harmonizes the focus on dyad-level mechanisms and endpoints, strengthens the scientific premise of our hypotheses, and reduces the risk of expending limited resources testing ineffective interventions. Use of dyadic theory should be considered a helpful compass, rather than a constraint, given the complexity and multiplicity of the research questions that can stem from studying two individuals *and* the patterns of interactions that make up their relationship. Importantly, investigators are not limited to a single option – there are many dyadic theories to choose from. For example, Lyons and Lee's (2018) Theory of Dyadic Illness Management, Bodenmann's (1997) Systemic Transactional Model, Berg & Upchurch's (2007) Developmental-Contextual Model of Couples Coping with Chronic Illness, Kelley and Thibaut's (1959 and later extensions) Interdependence Theory, and others.

Select Dyad-Level Measures with Care

Most quantitative approaches for examining relationship-level interactions require data from parallel instruments (i.e., same/similar measure administered to both dyad members). Measuring parallel constructs differently in persons with HF and care partners (or not collecting data on parallel constructs at all) reduces opportunities for gaining dyadic insights. Often, lack of parallel measurement stems from a larger lack of clarity or

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consistency in centering the dyad as the unit of analysis across all stages of research – from conceptualization of the research question through interpretation of results. In other cases, an instrument may be administered in-parallel, but the concept measured may not actually apply to both dyad members, or it may take on different conceptual meaning when different members of the dyad respond to it (e.g., HF-specific QOL administered to both patients and partners). This latter case may be entirely appropriate for certain research questions, but it requires researchers to invest great care in ensuring that second-order data derived from these measures will have the dyad-level meaning that they intend, and that results are interpreted in-kind.

Enhance Rigor in Dyadic Analysis

Using model accessibility – rather than theory – to drive research questions, and suboptimally applying those models, is a major threat to this area of science. Specifically, there is an over-reliance on dyadic modeling frameworks, most notably APIM, that are accessible and appropriate for dyadic data, but are frequently applied without theoretical justification for the hypothesized relationships being tested. Furthermore, few use multivariate APIM with integration of covariates, leaving observed effects unadjusted for key confounders (although there are exceptions[43]). At minimum, if APIM is utilized, adjustment for confounding factors (relationship type in particular[72]) is a must. Like the model itself, the APIM extension for adding covariates is accessible and has been well-described.[48] Methods and resources for estimating power for APIM analyses are also available, and one general method used for power calculation in APIM analyses (Monte Carlo simulation) is also commonly used to estimate power for other complex models, dyadic and others.[73] This is important, given that the preponderance of small sample sizes in HF dyadic research makes it likely that several dyadic analyses – APIM and otherwise – are underpowered. This elevates risk of false discovery in the exploration and testing of multiple effects, or risk for null findings due to lack of power or failure to test for theoretically- or empirically-justified effects. Quantitative dyadic analyses, regardless of model, must be undertaken with care and consideration: with theoretically and/or empirically justified hypothesis tests, use of appropriate outcomes measures and control variables, and adequately powered.

Center the Dyad in Dyadic Interventions

A critical element of dyadic intervention design is the *relationship* element. In dyadic HF trials, it is not always clear how the relationship was targeted, what aspects of the relationship were considered key mechanisms, or in what way (if at all) intervention components delivered to a dyad actually integrated, leveraged, or attempted to modify their interactions with one another. For example, in some instances it is unclear how dyadic education differed from delivering education to a single person, or to two unconnected individuals. When relationship-level mechanisms or components in dyadic trials are not well-described, it makes it difficult to interpret whether (or how) the results could be used to advance dyadic health. There are promising, early-stage interventions in HF which focus more clearly on relationship-level mechanisms,[74, 75] but larger-scale testing is required. Additionally, the promise of dyadic typology research in HF, where relationship-level

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patterns have been identified as determinants of meaningful outcomes, has been massively underutilized in informing relationship-level targets for precision interventions.

The relationship focus of dyadic research also allows for quantification of intervention effects at the relationship-level. This has gone essentially unleveraged in existing dyadic RCTs in HF – all trials report separate analyses of outcomes for patients and care partners as individual groups. Individual group analyses are certainly appropriate for outcomes that are salient for one dyad member but not the other (e.g., HF-specific QOL, care partner strain). However, most trials also include outcomes that are common to both dyad members or are measured in-parallel (e.g., HRQOL, HF knowledge, contributions to HF self-care). Common or parallel outcome measures can facilitate analyses where changes in both outcome variables for patient and partner can be quantified at both within-dyad and between-dyad levels. To illustrate, consider a hypothetical intervention with a significant positive effect for patients on a given outcome, but, for care partners on that same outcome, a highly variable, non-significant effect. A dyadic analysis could reveal relationship-level effects – obscured in the individual analyses – that may explain the variability in care partner response (e.g., cross partner effects that predict non-response, differential effects at the dyad-level, etc.). And overall, it is difficult to determine whether an intervention is improving *dyadic* health if all intervention outcomes and variability in outcomes are examined at only the individual (i.e., patient or care partner) level.

Importantly, mixed results across existing dyadic trials in HF do not necessarily indicate that dyadic interventions aren't beneficial. The dyadic literature in HF is less well-developed overall and has comparatively fewer trials than other chronic illness literatures with longer histories of family care research, such as cancer and dementia. However, dyadic trials in other chronic illnesses share similar heterogeneity, gaps, and limitations as dyadic RCTs in HF, demonstrating the inherent challenges of this type of research. Despite this, the broader literature also shows that dyadic interventions in chronic illness have significant beneficial effects on average, suggesting that the challenge is likely well worth the investment.[76–79]

Break Down Siloes Separating Dyadic Care Literatures

Solutions to some methodological issues facing dyadic HF research are relatively straightforward and will lead to considerable improvements in rigor, reproducibility, and translatability to clinical care. However, there are other major issues, for example, small sample sizes and lack of sample diversity, that are just as urgent but are more challenging to solve. On both counts, some pragmatism is warranted: unless funding priorities shift and the number of researchers in this space increase and diversify, this will remain a small and homogeneous body of science in perpetuity. However, we have an opportunity to move our relatively young field of dyadic HF research forward by better leveraging knowledge from more established dyadic care literatures (e.g., cancer, dementia), or the caregiving literature more broadly. Family care research in HF evolved somewhat independently of other family care literatures, but there are certainly features of care in other chronic illnesses that overlap with HF, either in terms of multimorbidity or in terms of disease experience or care aspects that are shared with the HF syndrome (e.g., symptom burden, cognitive impairment, uncertain trajectory/mortality). As HF family care researchers, we likely need

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to be much more facile in translating family care research from other contexts if we are going to have any hope of advancing our science with the speed, scope, and inclusiveness necessary to adequately address HF family care issues in clinical and policy spaces.

Concluding Thoughts

Dyadic research is complex, expensive, and difficult, and the impact of dyadic research in HF has been hampered by many challenges. First and foremost, it remains a comparatively small body of science that, in many cases, is only tangentially dyadic by definition. With a few exceptions, sample sizes are small and many studies are likely underpowered, potentially obscuring important effects. There is also a concerning probability that a number of significant effects observed across studies are a product of false discovery, with teams publishing many papers from a single dataset with a lack of clarity around the original aims. With few RCTs, the most prominent insights come from non-experimental studies, many of which have significant methodological limitations and minimal connection to dyadic theory. Existing RCTs are also characterized by methodological limitations and mixed results, and most focus primarily on individual rather than dyad-level endpoints.

Despite its challenges, the promise of dyadic research in HF remains exciting and high-impact. At its core, it seeks to improve both the health of persons with HF and the health of care partners – two at-risk populations. Additionally, it seeks to understand and support the health of their relationship, which itself is an established determinant of cardiovascular and overall health across the lifespan.[80] Although the majority of dyadic research in HF has focused on disease management, there are many dimensions of living and thriving with HF that hold value for patients and care partners. Further, although most dyadic research in HF includes relational elements, the main emphasis to-date has been on individual patient or care partner endpoints (typically, patient endpoints), with less focus on dyad-level outcomes. It is critical to recognize that the main advantage of dyadic research is that it holds the potential to better understand and intervene to improve (and hold in-balance) the health and well-being for *two* people (patient and care partner) on *two* levels (individual and relational). Going forward, we must seize the opportunity to leverage the full power and potential of dyadic research: both to benefit our patients and their care partners, and to preserve and strengthen the relationship ties that support their health, enrich their lives, and allow them to flourish.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations:

HF	Heart failure
NYHA Class	New York Heart Association Classification
QOL	Quality of life
LVAD	Left ventricular assist device
APIM	Actor-Partner Interdependence Model
HRQOL	Health-related quality of life
HF-specific QOL	Heart failure-specific quality of life
LGBTQ+	Lesbian, gay, bisexual, transgender, queer or questioning, and others
RCT	Randomized controlled trial

References

1. Kitko L, McIlvennan CK, Bidwell JT, Dionne-Odom JN, Dunlay SM, Lewis LM, Meadows G, Sattler ELP, Schulz R, Stromberg A, American Heart Association Council on C, Stroke N, Council on Quality of C, Outcomes R, Council on Clinical C, Council on L and Cardiometabolic H. Family Caregiving for Individuals With Heart Failure: A Scientific Statement From the American Heart Association. Circulation. 2020;141:e864–e878. [PubMed: 32349542]
2. Bennett PN, Wang W, Moore M and Nagle C. Care partner: A concept analysis. Nurs Outlook. 2017;65:184–194. [PubMed: 27993361]
3. Thompson L and Walker AJ. The dyad as the unit of analysis: Conceptual and methodological issues. J Marriage Fam. 1982;44:889–900.
4. Buck HG, Hupcey J, Wang HL, Fradley M, Donovan KA and Watach A. Heart Failure Self-care Within the Context of Patient and Informal Caregiver Dyadic Engagement: A Mixed Methods Study. J Cardiovasc Nurs. 2018;33:384–391. [PubMed: 29601368]
5. Buck HG, Hupcey J and Watach A. Pattern Versus Change: Community-Based Dyadic Heart Failure Self-Care. Clin Nurs Res. 2018;27:148–161. [PubMed: 28073288]
6. Kim JSR, Risbud R, Gray C, Banerjee D and Trivedi R. The Dyadic Experience of Managing Heart Failure: A Qualitative Investigation. J Cardiovasc Nurs. 2020;35:12–18. [PubMed: 31738215]
7. Buck HG, Kitko L and Hupcey JE. Dyadic heart failure care types: qualitative evidence for a novel typology. J Cardiovasc Nurs. 2013;28:E37–46. [PubMed: 23388704]
8. Liljeroos M, Agren S, Jaarsma T and Stromberg A. Perceived caring needs in patient-partner dyads affected by heart failure: a qualitative study. J Clin Nurs. 2014;23:2928–38. [PubMed: 24698101]
9. Retrum JH, Nowels CT and Bekelman DB. Patient and caregiver congruence: the importance of dyads in heart failure care. J Cardiovasc Nurs. 2013;28:129–36. [PubMed: 22343213]
10. Nelson KE, Saylor MA, Anderson A, Buck H, Davidson PM, DeGroot L, Fisher M, Gilotra NA, Pavlovic N and Szanton SL. “We’re all we got is each other”: Mixed-methods analysis of patient-caregiver dyads’ management of heart failure. Heart Lung. 2022;55:24–28. [PubMed: 35436655]
11. Kitko LA, Hupcey JE, Pinto C and Palese M. Patient and Caregiver Incongruence in Advanced Heart Failure. Clin Nurs Res. 2015;24:388–400. [PubMed: 24599063]
12. Risbud RD, Kim JS and Trivedi RB. It Takes a Village: Interpersonal Factors That Enhance Management of Heart Failure. J Cardiovasc Nurs. 2022;37:E160–E168. [PubMed: 35952314]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

13. Eisikovits Z and Koren C. Approaches to and outcomes of dyadic interview analysis. Qual Health Res. 2010;20:1642–55. [PubMed: 20663940]
14. Norlyk A, Haahr A and Hall E. Interviewing with or without the partner present?--an underexposed dilemma between ethics and methodology in nursing research. J Adv Nurs. 2016;72:936–45. [PubMed: 26708729]
15. Buck HG, Hupcey J, Juarez-Vela R, Vellone E and Riegel B. Heart Failure Care Dyadic Typology: Initial Conceptualization, Advances in Thinking, and Future Directions of a Clinically Relevant Classification System. J Cardiovasc Nurs. 2019;34:159–165. [PubMed: 30475246]
16. Cameron J, Thompson DR, Szer D, Greig J and Ski CF. Dyadic incongruence in chronic heart failure: Implications for patient and carer psychological health and self-care. J Clin Nurs. 2017;26:4804–4812. [PubMed: 28370704]
17. Bidwell JT, Vellone E, Lyons KS, D'Agostino F, Riegel B, Paturzo M, Hiatt SO, Alvaro R and Lee CS. Caregiver determinants of patient clinical event risk in heart failure. Eur J Cardiovasc Nurs. 2017;16:707–714. [PubMed: 28513209]
18. Timonet-Andreu E, Morales-Asencio JM, Alcala Gutierrez P, Cruzado Alvarez C, Lopez-Moyano G, Mora Banderas A, Lopez-Leiva I and Canca-Sanchez JC. Health-Related Quality of Life and Use of Hospital Services by Patients with Heart Failure and Their Family Caregivers: A Multicenter Case-Control Study. J Nurs Scholarsh. 2020;52:217–228. [PubMed: 32141224]
19. Bidwell JT, Lee CS, Higgins MK, Reilly CM, Clark PC and Dunbar SB. Caregiver Strain and Heart Failure Patient Clinical Event Risk: An Extension of Previous Work. J Cardiovasc Nurs. 2020;35:262–267. [PubMed: 32221144]
20. Bidwell JT, Hostinar CE, Higgins MK, Abshire MA, Cothran F, Butts B, Miller AH, Corwin E and Dunbar SB. Caregiver subjective and physiological markers of stress and patient heart failure severity in family care dyads. Psychoneuroendocrinology. 2021;133:105399. [PubMed: 34482256]
21. Bidwell JT, Lyons KS and Lee CS. Caregiver Well-being and Patient Outcomes in Heart Failure: A Meta-analysis. J Cardiovasc Nurs. 2017;32:372–382. [PubMed: 27617564]
22. Bidwell JT, Lyons KS, Mudd JO, Grady KL, Gelow JM, Hiatt SO, Chien CV and Lee CS. Patient and Caregiver Determinants of Patient Quality of Life and Caregiver Strain in Left Ventricular Assist Device Therapy. J Am Heart Assoc. 2018;7.
23. Chung ML, Lennie TA, Mudd-Martin G, Dunbar SB, Pressler SJ and Moser DK. Depressive symptoms in patients with heart failure negatively affect family caregiver outcomes and quality of life. Eur J Cardiovasc Nurs. 2016;15:30–8. [PubMed: 24829295]
24. Chung ML, Moser DK, Lennie TA and Rayens MK. The effects of depressive symptoms and anxiety on quality of life in patients with heart failure and their spouses: testing dyadic dynamics using Actor-Partner Interdependence Model. J Psychosom Res. 2009;67:29–35. [PubMed: 19539816]
25. Al-Rawashdeh SY, Lennie TA and Chung ML. The Association of Sleep Disturbances With Quality of Life in Heart Failure Patient-Caregiver Dyads. West J Nurs Res. 2017;39:492–506. [PubMed: 27758952]
26. Agren S, Evangelista L, Davidson T and Stromberg A. The influence of chronic heart failure in patient-partner dyads--a comparative study addressing issues of health-related quality of life. J Cardiovasc Nurs. 2011;26:65–73. [PubMed: 21127426]
27. Vellone E, Chung ML, Cocchieri A, Rocco G, Alvaro R and Riegel B. Effects of self-care on quality of life in adults with heart failure and their spousal caregivers: testing dyadic dynamics using the actor-partner interdependence model. J Fam Nurs. 2014;20:120–41. [PubMed: 24189325]
28. Dellafiore F, Chung ML, Alvaro R, Zeffiro V, Ercole V and Pucciarelli G. Influence of mutuality on quality of life in heart failure patient with inadequate self-care and caregiver dyads: an actor-partner interdependence model analysis. Eur J Cardiovasc Nurs. 2022;21:366–373. [PubMed: 34661635]
29. Liljeroos MA, Miller JL, Lennie TA and Chung ML. Quality of life and family function are poorest when both patients with heart failure and their caregivers are depressed. Eur J Cardiovasc Nurs. 2022;21:220–226. [PubMed: 34436564]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

30. Zhang J, Chai X, Ye Y, Zhao Q and Fan X. Association between sleep and quality of life in heart failure patient-caregiver dyads and mediation of fatigue: An actor-partner interdependence mediation model. J Adv Nurs. 2022;78:2436–2447. [PubMed: 35133026]

31. Thomson P, Howie K, Leslie SJ, Angus NJ, Andreis F, Thomson R, Mohan ARM, Mondoa C and Chung ML. Evaluating emotional distress and health-related quality of life in patients with heart failure and their family caregivers: Testing dyadic dynamics using the Actor-Partner Interdependence Model. PLoS One. 2020;15:e0227129. [PubMed: 31914152]

32. Rossi Ferrario S, Panzeri A and Pistono M. Psychological difficulties of LVAD patients and caregivers: A follow up over one year from discharge. Artif Organs. 2022;46:479–490. [PubMed: 34519060]

33. Dellafiore F, Chung ML, Alvaro R, Durante A, Colaceci S, Vellone E and Pucciarelli G. The Association Between Mutuality, Anxiety, and Depression in Heart Failure Patient-Caregiver Dyads: An Actor-Partner Interdependence Model Analysis. J Cardiovasc Nurs. 2019;34:465–473. [PubMed: 31365444]

34. Trivedi RB, Piette J, Fihn SD and Edelman D. Examining the interrelatedness of patient and spousal stress in heart failure: conceptual model and pilot data. J Cardiovasc Nurs. 2012;27:24–32. [PubMed: 21743348]

35. Zhou T, Qu J, Sun H, Xue M and Liu Y. Relationship between mutuality and depression in patients with chronic heart failure and caregivers in China: An actor-partner interdependence model analysis. Front Psychol. 2022;13:928311. [PubMed: 36160581]

36. Sebern M and Riegel B. Contributions of supportive relationships to heart failure self-care. Eur J Cardiovasc Nurs. 2009;8:97–104. [PubMed: 18706865]

37. Buck HG, Mogle J, Riegel B, McMillan S and Bakitas M. Exploring the Relationship of Patient and Informal Caregiver Characteristics with Heart Failure Self-Care Using the Actor-Partner Interdependence Model: Implications for Outpatient Palliative Care. J Palliat Med. 2015;18:1026–32. [PubMed: 26540092]

38. Hooker SA, Schmiege SJ, Trivedi RB, Amoyal NR and Bekelman DB. Mutuality and heart failure self-care in patients and their informal caregivers. Eur J Cardiovasc Nurs. 2018;17:102–113. [PubMed: 28868917]

39. Quinn C, Dunbar SB and Higgins M. Heart failure symptom assessment and management: can caregivers serve as proxy? J Cardiovasc Nurs. 2010;25:142–8. [PubMed: 20168194]

40. Sharifi H, Rezaei MA, Khayat NH and Mohammandinia N. Agreement between heart failure patients and their primary saregivers on symptom assessment. Int J Community Based Nurs Midwifery. 2018;6:89–98. [PubMed: 29344539]

41. Lee CS, Mudd JO, Auld J, Gelow JM, Hiatt SO, Chien CV, Bidwell JT and Lyons KS. Patterns, relevance and predictors of heart failure dyadic symptom appraisal. Eur J Cardiovasc Nurs. 2017;16:595–604. [PubMed: 28895484]

42. Kim J, Shin MS, Park YM, Lee HN, Heo S and Ounpraseuth S. Associations of Advance Directive Knowledge, Attitudes, and Barriers/Benefits With Preferences for Advance Treatment Directives Among Patients With Heart Failure and Their Caregivers. J Card Fail. 2020;26:61–69. [PubMed: 31344402]

43. McIlvennan CK, Matlock DD, Allen LA, Thompson JS, Ranby KW and Sannes TS. Perceived Stress and Depressive Symptoms as Predictors of Decisional Conflict in Dyads Considering a Left Ventricular Assist Device. Circ Cardiovasc Qual Outcomes. 2020;13:e006155. [PubMed: 32148099]

44. Lyons KS and Lee CS. Understanding the family care dyad: A comparison of two multilevel models. Eur J Cardiovasc Nurs. 2020;19:178–184. [PubMed: 32041428]

45. Kenny DA and Ledermann T. Detecting, measuring, and testing dyadic patterns in the actor-partner interdependence model. J Fam Psychol. 2010;24:359–66. [PubMed: 20545409]

46. Lyons KS and Sayer AG. Using multilevel modeling in caregiving research. Aging Ment Health. 2005;9:189–95. [PubMed: 16019272]

47. Ganong LH. Selecting family measurements. Journal of Family Nursing. 2003;9:184–206.

48. Stas L, Kenny DA, Mayer A and Loeys T. Giving dyadic data analysis away: A user-friendly app for actor–partner interdependence models. Personal Relationships. 2018;25:103–119.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

49. Vellone E, Chung ML, Alvaro R, Paturzo M and Dellafiore F. The Influence of Mutuality on Self-Care in Heart Failure Patients and Caregivers: A Dyadic Analysis. J Fam Nurs. 2018;24:563–584. [PubMed: 30453797]
50. Lyons KS, Vellone E, Lee CS, Cocchieri A, Bidwell JT, D'Agostino F, Hiatt SO, Alvaro R, Vela RJ and Riegel B. A Dyadic Approach to Managing Heart Failure With Confidence. J Cardiovasc Nurs. 2015;30:S64–71. [PubMed: 25658186]
51. Bidwell JT, Vellone E, Lyons KS, D'Agostino F, Riegel B, Juarez-Vela R, Hiatt SO, Alvaro R and Lee CS. Determinants of Heart Failure Self-Care Maintenance and Management in Patients and Caregivers: A Dyadic Analysis. Res Nurs Health. 2015;38:392–402. [PubMed: 26355702]
52. Irani E, Buck HG, Lyons KS, Margevicius S, Vellone E, Bugajski A and De Maria M. Examining how congruence in and satisfaction with dyadic care type appraisal contribute to quality of life in heart failure care dyads. Eur J Cardiovasc Nurs. 2022.
53. Lyons KS, Hiatt SO, Gelow JM, Auld J, Mudd JO, Chien CV and Lee CS. Depressive symptoms in couples living with heart failure: the role of congruent engagement in heart failure management. Aging Ment Health. 2018;22:1585–1591. [PubMed: 28959891]
54. Lyons KS, Gelow JM, Hiatt SO, Mudd JO, Auld J, Chien CV and Lee CS. The Role of Dyadic Confidence on Engagement in Heart Failure Care Behaviors. Gerontologist. 2018;58:635–643. [PubMed: 28449107]
55. Bidwell JT, Higgins MK, Reilly CM, Clark PC and Dunbar SB. Shared heart failure knowledge and self-care outcomes in patient-caregiver dyads. Heart Lung. 2018;47:32–39. [PubMed: 29153759]
56. Lee CS, Sethares KA, Thompson JH, Faulkner KM, Aarons E and Lyons KS. Patterns of Heart Failure Dyadic Illness Management: The Important Role of Gender. J Cardiovasc Nurs. 2020;35:416–422. [PubMed: 32496366]
57. Stawnychy MA, Vellone E, Zeffiro V, Teitelman AM, Maria M and Riegel B. Dyad Gender and Relationship Quality Influence Heart Failure Self-Care. Clin Nurs Res. 2022:10547738221119338.
58. Buck HG, Stromberg A, Chung ML, Donovan KA, Harkness K, Howard AM, Kato N, Polo R and Evangelista LS. A systematic review of heart failure dyadic self-care interventions focusing on intervention components, contexts, and outcomes. Int J Nurs Stud. 2018;77:232–242. [PubMed: 29128777]
59. Agren S, Evangelista LS, Hjelm C and Stromberg A. Dyads affected by chronic heart failure: a randomized study evaluating effects of education and psychosocial support to patients with heart failure and their partners. J Card Fail. 2012;18:359–66. [PubMed: 22555264]
60. Dunbar SB, Clark PC, Reilly CM, Gary RA, Smith A, McCarty F, Higgins M, Grossniklaus D, Kaslow N, Frediani J, Dashiff C and Ryan R. A trial of family partnership and education interventions in heart failure. J Card Fail. 2013;19:829–41. [PubMed: 24331203]
61. Piette JD, Striplin D, Marinec N, Chen J and Aikens JE. A randomized trial of mobile health support for heart failure patients and their informal caregivers: impacts on caregiver-reported outcomes. Med Care. 2015;53:692–9. [PubMed: 26125415]
62. Piette JD, Striplin D, Marinec N, Chen J, Trivedi RB, Aron DC, Fisher L and Aikens JE. A Mobile Health Intervention Supporting Heart Failure Patients and Their Informal Caregivers: A Randomized Comparative Effectiveness Trial. J Med Internet Res. 2015;17:e142. [PubMed: 26063161]
63. Srisuk N, Cameron J, Ski CF and Thompson DR. Randomized controlled trial of family-based education for patients with heart failure and their carers. J Adv Nurs. 2017;73:857–870. [PubMed: 27779768]
64. Agren S, Berg S, Svedjeholm R and Stromberg A. Psychoeducational support to post cardiac surgery heart failure patients and their partners--a randomised pilot study. Intensive Crit Care Nurs. 2015;31:10–8. [PubMed: 24969363]
65. Piamjariyakul U, Werkowitch M, Wick J, Russell C, Vacek JL and Smith CE. Caregiver coaching program effect: Reducing heart failure patient rehospitalizations and improving caregiver outcomes among African Americans. Heart Lung. 2015;44:466–73. [PubMed: 26307539]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

66. Apesoa-Varano EC, Tang-Feldman Y, Reinhard SC, Choula R and Young HM. Multi-cultural caregiving and caregiver interventions: A look back and a call for future action. Generations: Journal of the American Society on Aging. 2015;39:39–48.

67. Yehya A Challenges of the LGBT Community in Health Care: Focus on Heart Failure. J Card Fail. 2022;28:499–502. [PubMed: 35121150]

68. Morris A, Shah KS, Enciso JS, Hsich E, Ibrahim NE, Page R and Yancy C. HFSA Position Statement The Impact of Healthcare Disparities on Patients with Heart Failure. J Card Fail. 2022.

69. Dilworth-Anderson P, Moon H and Aranda MP. Dementia Caregiving Research: Expanding and Reframing the Lens of Diversity, Inclusivity, and Intersectionality. Gerontologist. 2020;60:797–805. [PubMed: 32667672]

70. Dilworth-Anderson P and Williams SW. Recruitment and retention strategies for longitudinal African American caregiving research: the Family Caregiving Project. J Aging Health. 2004;16:137S–56S. [PubMed: 15448291]

71. Gallagher-Thompson D, Solano N, Coon D and Arean P. Recruitment and retention of latino dementia family caregivers in intervention research: issues to face, lessons to learn. Gerontologist. 2003;43:45–51. [PubMed: 12604745]

72. Pinquart M and Sorensen S. Spouses, adult children, and children-in-law as caregivers of older adults: a meta-analytic comparison. Psychol Aging. 2011;26:1–14. [PubMed: 21417538]

73. Ledermann T, Rudaz M, Wu Q and Cui M. Determine power and sample size for the simple and mediation Actor–Partner Interdependence Model. Family Relations. 2022;71:1452–1469.

74. Irani E, Niyomyart A, Dolansky MA, Stephens JP, Ganocy SJ, Josephson RA and Hickman RL Jr., A pilot randomized clinical trial of a teamwork intervention for heart failure care dyads. Heart Lung. 2021;50:877–884. [PubMed: 34407481]

75. Lyons KS, Whitlatch CJ, Vest AR, Upshaw JN, Johnson SH, Morelock J and Lee CS. Taking Care of Us(c) (TCU) study protocol: feasibility and acceptability of a dyadic intervention for couples living with heart failure. Pilot Feasibility Stud. 2023;9:16. [PubMed: 36698174]

76. Badr H, Bakhshaie J and Chhabria K. Dyadic Interventions for Cancer Survivors and Caregivers: State of the Science and New Directions. Semin Oncol Nurs. 2019;35:337–341. [PubMed: 31248677]

77. Martire LM and Helgeson VS. Close relationships and the management of chronic illness: Associations and interventions. Am Psychol. 2017;72:601–612. [PubMed: 28880106]

78. Martire LM, Lustig AP, Schulz R, Miller GE and Helgeson VS. Is it beneficial to involve a family member? A meta-analysis of psychosocial interventions for chronic illness. Health Psychol. 2004;23:599–611. [PubMed: 15546228]

79. Van't Leven N, Prick AE, Groenewoud JG, Roelofs PD, de Lange J and Pot AM. Dyadic interventions for community-dwelling people with dementia and their family caregivers: a systematic review. Int Psychogeriatr. 2013;25:1581–603. [PubMed: 23883489]

80. Umberson D and Thomeer MB. Family Matters: Research on Family Ties and Health, 2010–2020. J Marriage Fam. 2020;82:404–419. [PubMed: 33867573]

81. Cheng M, Zhu C, Ge Y, Ke Y, Shi Y, Su Y, Ma T, Chi M, Wang N, Lu B and Hou Y. The impact of informal caregiver's preparedness on short-term outcomes of heart failure patients with insufficient self-care. Eur J Cardiovasc Nurs. 2022.

82. Levin JB, Peterson PN, Dolansky MA and Boxer RS. Health literacy and heart failure management in patient-caregiver dyads. J Card Fail. 2014;20:755–761. [PubMed: 25072623]

83. Hwang B, Fleischmann KE, Howie-Esquivel J, Stotts NA and Dracup K. Caregiving for patients with heart failure: impact on patients' families. Am J Crit Care. 2011;20:431–41; quiz 442. [PubMed: 22045140]

84. Shamali M, Konradsen H, Stas L and Ostergaard B. Dyadic effects of perceived social support on family health and family functioning in patients with heart failure and their nearest relatives: Using the Actor-Partner Interdependence Mediation Model. PLoS One. 2019;14:e0217970. [PubMed: 31163068]

85. Lee CS, Vellone E, Lyons KS, Cocchieri A, Bidwell JT, D'Agostino F, Hiatt SO, Alvaro R, Buck HG and Riegel B. Patterns and predictors of patient and caregiver engagement in heart failure care: a multi-level dyadic study. Int J Nurs Stud. 2015;52:588–97. [PubMed: 25468283]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

86. Wooldridge JS, Gray C, Pukhraj A, Geller J and Trivedi RB. Understanding communal coping among patients and informal caregivers with heart failure: A mixed methods secondary analysis of patient-caregiver dyads. Heart Lung. 2019;48:486–495. [PubMed: 31171368]

87. Bouldin ED, Aikens JE, Piette JD and Trivedi RB. Relationship and communication characteristics associated with agreement between heart failure patients and their Carepartners on patient depressive symptoms. Aging Ment Health. 2019;23:1122–1129. [PubMed: 30569750]

88. Lyons RF, Mickelson KD, Sullivan MJL and Coyne JC. Coping as a Communal Process. Journal of Social and Personal Relationships. 1998;15:579–605.

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Highlights:

- Care partners are family or friends that provide unpaid support to patients
- Dyadic research focuses on the patient and care partner as an interdependent team
- Dyadic literature in heart failure consists primarily of disease management studies
- Provides evidence heart failure is a shared experience affecting both dyad members
- Holds promise for improving patient, care partner, and relationship health

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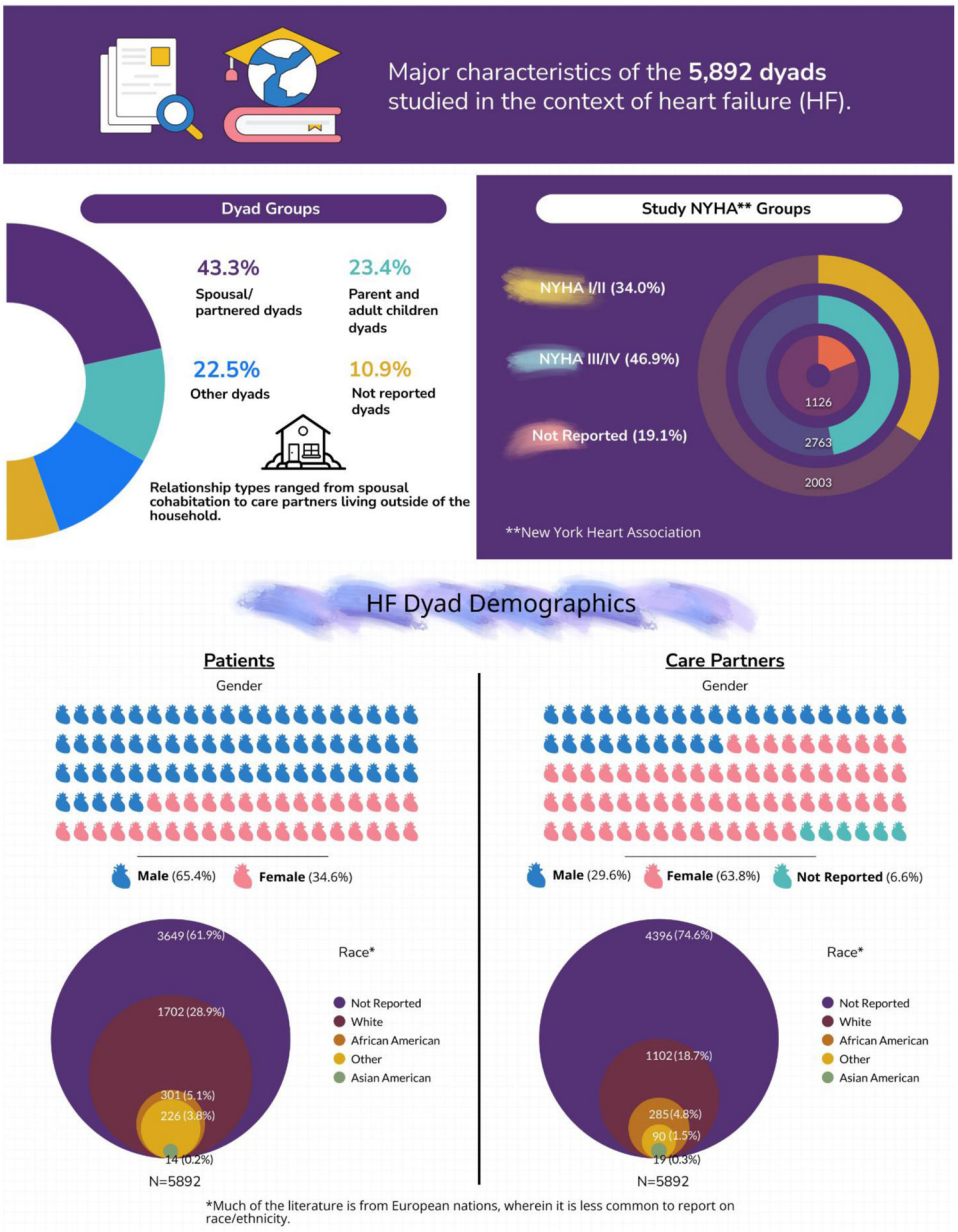

Figure 1:
Characteristics of Heart Failure Dyads

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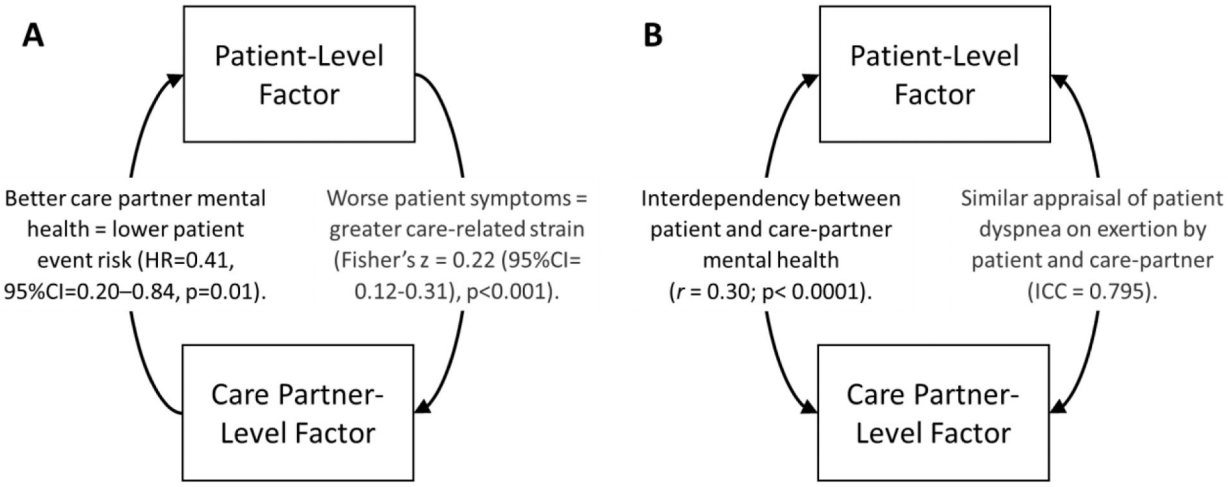

Figure 2: Simple Transactional Effects, Interdependencies and Shared Appraisal

Figure 2A presents simple interpersonal effects involving measures that are different between patients with heart failure and their care partners. The first example from Bidwell et al., 2017 shows the link between care partner mental health and lower patient clinical event risk. The second example from Bidwell et al., 2015 shows a link between worse patient symptoms and greater care-related strain on the part of their care partners. Figure 2B presents simple interdependencies between patients and their care partners on the same measure. The first example from Timonet-Andreu et al., 2020 shows shared mental health between patients with heart failure and their care partners. Figure 2B also presents simple shared appraisal where both members of the dyad appraise the patient's symptoms. The second example from Sharifi et al., 2018 shows shared appraisal of patient dyspnea on exertion as experienced by the patient and perceived by their care partner

Abbreviations: 95%CI = 95% confidence interval; HR = hazard ratio; ICC = intraclass correlation coefficient; r = Pearson's correlation

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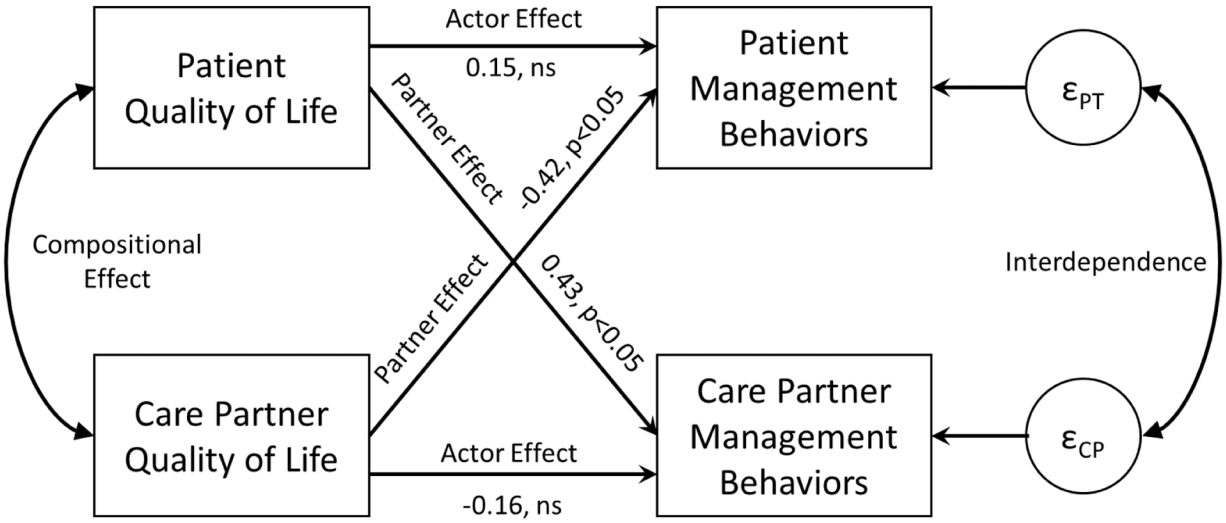

Figure 3: Multivariate Dyadic Model of Actor-Partner Interdependence.

This figure presents a multivariate dyadic model, meaning that heart failure management behaviors are separate outcomes of the patient and their care partner. Interdependence between the outcomes is controlled for. Endogenous variables cannot correlate with each other in this type of equation modeling; instead, the error in patient and care partner management behaviors is correlated. Actor effects (patient factors influencing patient outcomes, or care partner factors influencing care partner outcomes) and partner effects (patient factors influencing care partner outcomes, or care partner factors influencing patient outcomes) can be modeled to explain interdependence in the outcomes with additional consideration of compositional effects (i.e., how the predictors also are relational and therefor correlated). These data are from an analysis by Bidwell et al. 2015, showing partner effects wherein patient quality of life influences care partner management behaviors, and wherein care partner quality of life influences patient HF management behaviors. Actor effects were not significant

Abbreviations: ε = error; CP = care partner; ns = p value >0.05, PT = patient

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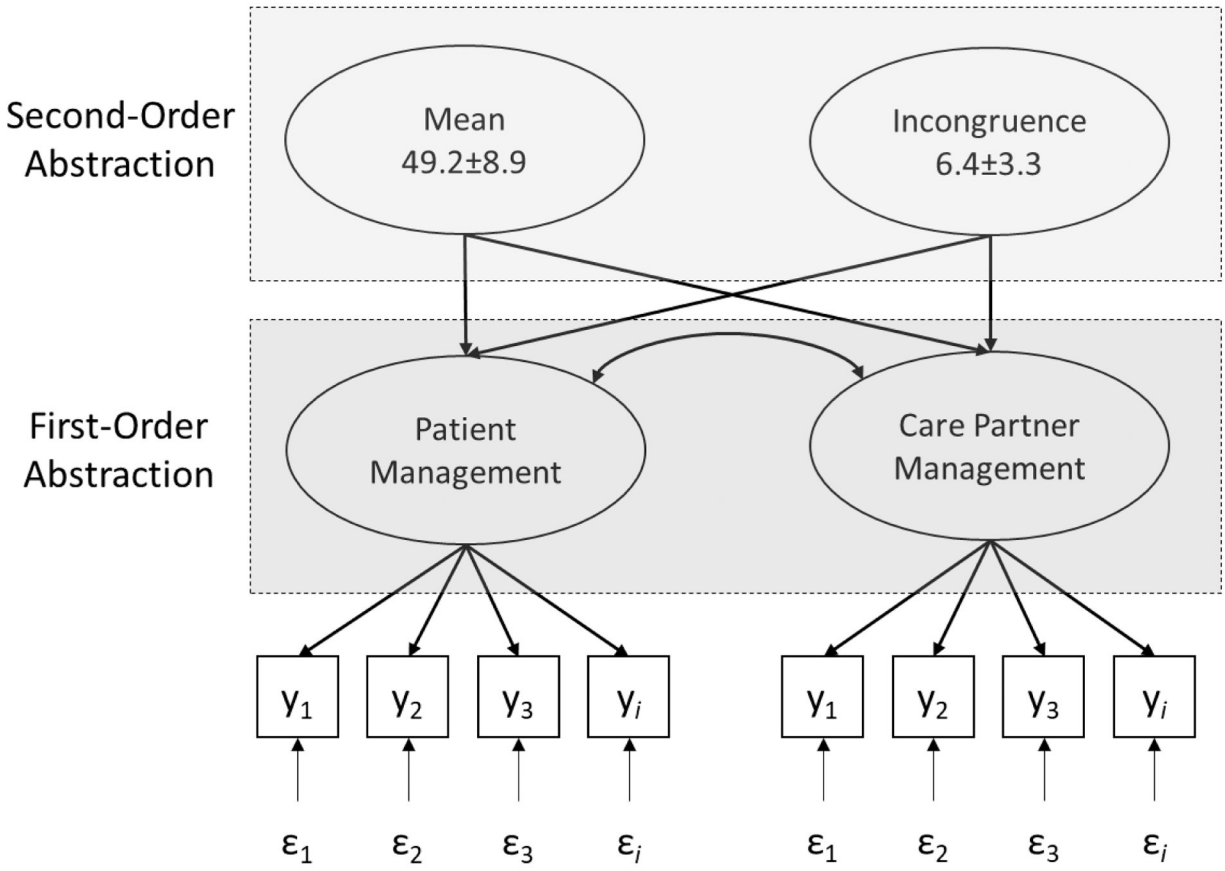

Figure 4: Univariate Dyadic Model with Empirical Bayes Estimates of Mean and Incongruence.

This figure presents a univariate dyadic model, meaning that new second-order variables are created with the dyad as the unit of analysis. Importantly, empirical Bayes estimates of dyadic mean and dyadic incongruence are adjusted for interdependence (bidirectional arrow) between the first-order variables (i.e. patient and care partner management that are calculated based on several items) as well as for measurement error. These data are from an analysis by Lee et al. 2015, which found a dyadic mean management of 49.2 (i.e., how well they are doing together) and dyadic incongruence in management of 6.4 (i.e., who is contributing more, and in what direction and magnitude). Many univariate approaches also integrate predictors of incongruence, or use incongruence to predict another outcome

Abbreviations: ε = error; y = items on the patient and care partner versions of the self-care management scale.

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Table 1:

Significant Transactional Effects

Predictor		Outcome	Effect and Citation
Care Partner Factor		*Patient Outcome*	
↑ greater care partner strain	on	↑ patient event-free survival	HR = 0.94, 95%CI= 0.91–0.97[17]
↑ care partner mental health	on	↑ patient event-free survival	HR=0.41, 95%CI= 0.20–0.84[17]
↑ care partner contributions to self-care maintenance	on	↑ patient event-free survival	HR=0.99, 95%CI= 0.97–0.99[17]
↑ care partner contributions to self-care management	on	↓ patient event-free survival	HR=1.01, 95%CI= 1.00–1.03[17]
↑ care partner-assessed relationship closeness	on	↑ patient quality of life	β= 14.39±5.85[22]
↑ greater care-related strain	on	↑ patient symptoms	z = 0.22, 95%CI= 0.12–0.31[21]
↑ care partner depressive symptoms	on	↓ patient social support	r = −0.47[34]
↑ care partner depressive symptoms	on	↓ patient relationship satisfaction	r = −0.51[34]
↑ care partner preparedness	on	↓ patient 3-month mortality	OR = 0.92, 95%CI= 0.86–0.99[81]
↑ care partner preparedness	on	↓ patient 3-month readmission	OR = 0.89, 95%CI= 0.81–0.96[81]
↑ care partner preparedness	on	↓ patient length of stay	β = −0.071, 95%CI= −0.11 to −0.03[81]
Care Partner Factor		***Patient Self-Care***	
↓ care partner label reading ability	on	↓ patient self-care maintenance	76.9 vs. 64.0, t=2.6[82]
↑ care partner-assessed patient decision-making capacity	on	↑ patient self-care maintenance	r = 0.29[36]
↑ care partner-assessed patient decision-making capacity	on	↑ patient self-care confidence	r = 0.37[36]
↑ care partner-assessed relationship closeness	on	↑ patient self-care confidence	r = 0.35[36]
↑ care partner depressive symptoms	on	↓ patient confidence in self-care	r = −0.48[34]
Patient Factor		***Care Partner Outcome***	
↑ # of patient hospitalizations	on	↓ care partner mental health	OR=1.48, 95%CI= 1.23–1.79[18]
↑ days since hospitalization	on	↓ care partner health	β = −0.276, t=−2.74[83]
↑ patient NYHA class	on	↓ care partner family support	β = 0.17, t=2.05[83]
↑ patient NYHA class	on	↑ disruption in care partner usual activities	β = 0.27, t=3.08[83]
↑ patient depressive symptoms	on	↑ care partner burden	24.9±13.1 vs. 13.6±12.0[23]
↑ patient depressive symptoms	on	↓ care partner mental health	45.5±10.3 vs. 50.6±10.0[23]
↑ patient symptoms	on	↑ care related strain	β =0.15±0.07[22]

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Table 2:

Significant Interdependencies and Shared Appraisal

Mental Health
Mental health ($r = 0.30$)[18]
Mental health ($r = 0.30$)[25]
Mental health (no difference)[26]
Mental quality of life ($r = 0.30$)[27]
Mental quality of life ($r = 0.16$)[30]
Mental quality of life ($r = 0.12$)[28]
Mental quality of life ($r = 0.38$)[29]
Depression ($r = 0.09$ not sig)[24]
Depression ($r = 0.33$)[29]
Depression ($r = 0.25$)[35]
Depression ($r = 0.147$)[33]
Depression ($r = 0.53$)[34]
Anxiety ($r = -0.01$ not sig)[24]
Anxiety ($r = 0.13$)[33]
Emotional symptoms (all t-tests not sig)[31]
Negative emotions in response to patient illness ($r = 0.54$)[32]
Physical Health
Physical health ($r = 0.34$)[25]
Physical quality of life ($r = 0.10$ not sig)[27]
Physical quality of life ($r = 0.09$ not sig)[28]
Physical quality of life ($r = 0.13$)[30]
Physical quality of life ($r = 0.28$)[29]
Physical quality of life (patient worse in all domains)[26]
Sleep disturbances ($r = 0.19$ not sig)[25]
Sleep quality ($r = 0.27$)[30]
Fatigue ($r = 0.32$)[30]
Appraisal of Relationship
Relationship type ($r = 0.68$)[37]
Satisfaction ($r = 0.62$)[34]
Reciprocity ($r = 0.50$)[36]
Mutuality ($r = 0.52$)[33]
Mutuality ($r = 0.52$)[38]
Mutuality (total score: $r = 0.54$; all domains: $r = 0.43$ to 0.57)[28]
Mutuality (total score: $r = 0.57$; all domains: $r = 0.50$ to 0.55)[35]
Communication ($r = 0.46$)[36]
Decision-making ($r = 0.50$)[36]
Appraisal of Patient Symptoms/Function

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Physical symptoms (r = 0.05 (bloating) to 0.62 (edema))[39]
Physical symptoms (r = 0.31 (palpitations) to 0.87 (edema))[40]
Appraisal of patient functional limitations (r = 0.91)[34]
Contributions to Heart Failure Care
Contributions to HF care maintenance (r = 0.29)[27]
Contributions to HF care management (r = 0.48)[27]
Contributions to HF care confidence (r = 0.51)[27]
Decision-Making Regarding Heart Failure Treatment
Patient wishes regarding hospice (κ = 0.42)[42]
Decisional conflict related to pursuing LVAD (β = 0.47)[43]

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Table 3:

Tested Partner Effects in APIM Models

Patient		Care Partner	Effect	Care Partner		Patient	Effect	Ref
Perception of Relationship	on	Maintenance	β=0.01, p=0.97	Perception of Relationship	on	Maintenance	β=0.08, p=0.76	37
Perception of Relationship	on	Management	β=0.18, p=0.53	Perception of Relationship	on	Management	β=−0.31, p=0.22	37
Perception of Relationship	on	Confidence	β=0.09, p=0.65	Perception of Relationship	on	Confidence	β=−0.20, p=0.42	37
Mutuality	on	Anxiety	β=−0.01, p=0.863	Mutuality	on	Anxiety	β=−0.06, p=0.363	33
Mutuality	on	Depression	β=−0.01, p=0.834	Mutuality	on	Depression	β=−0.09, p=0.118	33
Mutuality	on	Depression	β=−0.37, p=0.628	**Mutuality**	**on**	**Depression**	**β=0.200, p=0.004**	35
Mutuality	on	Physical QOL	β=−0.055, p=0.287	**Mutuality**	**on**	**Physical QOL**	**β=0.179, p=0.001**	28
Mutuality	on	Mental QOL	β=0.037, p=0.489	Mutuality	on	Mental QOL	β=−0.029, p=0.593	28
Mutuality	on	Maintenance	β=0.035, p=0.641	Mutuality	on	Maintenance	β=0.071, p=0.138	49
Mutuality	**on**	**Management**	**β=0.201, p=0.014**	Mutuality	on	Management	β=0.028, p=0.677	49
Mutuality	on	Confidence	β=0.019, p=0.768	Mutuality	on	Confidence	β=0.023, p=0.693	49
Mutuality	on	Confidence	β=−0.78, p=0.865	Mutuality	on	Confidence	β= 3.60, p=0.340	38
Reciprocity	on	Anxiety	β=0.00, p=0.995	Reciprocity	on	Anxiety	β=−0.01, p=0.858	33
Reciprocity	on	Depression	β=−0.02, p=0.716	Reciprocity	on	Depression	β=−0.07, p=0.203	33
Reciprocity	on	Depression	β=−0.067, p=0.359	**Reciprocity**	**on**	**Depression**	**β=0.142, p=0.034**	35
Reciprocity	on	Physical QOL	β=−0.098, p=0.055	**Reciprocity**	**on**	**Physical QOL**	**β=0.161, p=0.001**	28
Reciprocity	on	Mental QOL	β=0.027, p=0.590	Reciprocity	on	Mental QOL	β=0.011, p=0.828	28
Reciprocity	on	Maintenance	β=0.057, p=0.437	**Reciprocity**	**on**	**Maintenance**	**β=0.087, p=0.046**	49
Reciprocity	**on**	**Management**	**β=0.206, p=0.013**	**Reciprocity**	**on**	**Management**	**β=0.121, p=0.042**	49
Reciprocity	on	Confidence	β=0.025, p=0.692	Reciprocity	on	Confidence	β=0.064, p=0.220	49
Love and affection	on	Anxiety	β=0.09, p=0.127	Love and affection	on	Anxiety	β=−0.07, p=0.441	33
Love and affection	**on**	**Depression**	**β=0.133, p=0.040**	Love and affection	on	Depression	β=−0.09, p=0.092	33
Love and affection	on	Depression	β=−0.088, p=0.237	Love and affection	on	Depression	β=0.100, p=0.143	35
Love and affection	on	Physical QOL	β=−0.016, p=0.741	Love and affection	on	Physical QOL	β=0.032, p=0.544	28
Love and affection	on	Mental QOL	β=0.015, p=0.753	Love and affection	on	Mental QOL	β=−0.069, p=0.179	28
Love and affection	on	Maintenance	β=−0.035, p=0.613	Love and affection	on	Maintenance	β=0.073, p=0.123	49
Love and affection	on	Management	β=0.071, p=0.347	Love and affection	on	Management	β=0.073, p=0.267	49

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Patient		Care Partner	Effect	Care Partner		Patient	Effect	Ref
Love and affection	on	Confidence	*β*=0.019, p=0.753	Love and affection	on	Confidence	*β*=0.087, p=0.128	49
Shared pleasurable activities	on	Anxiety	*β*=−0.02, p=0.712	Shared pleasurable activities	on	Anxiety	*β*=−0.06, p=0.204	33
Shared pleasurable activities	on	Depression	*β*=−0.02, p=0.712	Shared pleasurable activities	on	Depression	*β*=−0.10, p=0.086	33
Shared Pleasurable activities	on	Depression	*β*=0.019, p=0.805	**Shared Pleasurable activities**	**on**	**Depression**	***β*=0.193, p=0.006**	35
Shared Pleasurable activities	on	Physical QOL	*β*=0.007, p=0.896	**Shared Pleasurable activities**	**on**	**Physical QOL**	***β*=0.188, p<0.001**	28
Shared Pleasurable activities	on	Mental QOL	*β*=0.067, p=0.190	Shared Pleasurable activities	on	Mental QOL	*β*=−0.015, p=0.771	28
Shared pleasurable activities	on	Maintenance	*β*=−0.005, p=0.950	Shared pleasurable activities	on	Maintenance	*β*=0.087, p=0.050	49
Shared pleasurable activities	on	Management	*β*=0.157, p=0.059	Shared pleasurable activities	on	Management	*β*=0.025, p=0.689	49
Shared pleasurable activities	on	Confidence	*β*=0.034, p=0.587	Shared pleasurable activities	on	Confidence	*β*=0.074, p=0.169	49
Shared values	on	Anxiety	*β*=−0.09, p=0.146	Shared values	on	Anxiety	*β*=−0.05, p=0.405	33
Shared values	on	Depression	*β*=−0.07, p=0.268	Shared values	on	Depression	*β*=−0.05, p=0.268	33
Shared values	on	Depression	*β*=−0.016, p=0.829	**Shared values**	**on**	**Depression**	***β*=0.156, p=0.019**	35
Shared values	on	Physical QOL	*β*=−0.075, p=0.152	**Shared values**	**on**	**Physical QOL**	***β*=0.114, p=0.042**	28
Shared values	on	Mental QOL	*β*=0.082, p=0.127	Shared values	on	Mental QOL	*β*=−0.017, p=0.759	28
Shared values	on	Maintenance	*β*=0.030, p=0.394	**Shared values**	**on**	**Maintenance**	***β*=0.132, p=0.006**	49
Shared values	on	Management	*β*=0.051, p=0.541	Shared values	on	Management	*β*=0.118, p=0.084	49
Shared values	on	Confidence	*β*=0.013, p=0.851	Shared values	on	Confidence	*β*=0.004, p=0.949	49
Social support	on	Family functioning	β=−0.05, p=0.225	Social support	on	Family functioning	β=0.04, p=0.296	84
Family health	on	Family functioning	β=0.10, p=0.084	**Family health**	**on**	**Family functioning**	**β=0.24, p<0.001**	84
Stress	on	Decisional conflict	β = 0.069, ns	Stress	on	Decisional conflict	β = 0.013, ns	43
Depression	on	Decisional conflict	β = 0.042, ns	Depression	on	Decisional conflict	β = 0.070, ns	43
Depression	on	HRQOL	β=2.16, p=0.553	**Depression**	**on**	**HRQOL**	**β=9.08, p<0.001**	31
Depression	on	QOL	β = 3.84, p=0.058	**Depression**	**on**	**QOL**	**β= 5.57, p=0.031**	24
Depression	on	Maintenance	*β*=0.26, p=0.12	**Depression**	**on**	**Maintenance**	***β*=−0.56, p<0.01**	37
Depression	on	Management	*β*=0.29, p=0.10	Depression	on	Management	*β*=−0.02, p=0.93	37
Depression	on	Confidence	*β*=−0.12, p=0.50	Depression	on	Confidence	*β*=−0.16, p=0.41	37
Anxiety	on	HRQOL	β=3.16, p=0.317	**Anxiety**	**on**	**HRQOL**	**β=11.53, p<0.001**	31
Anxiety	on	QOL	β = 1.07, p=0.789	**Anxiety**	**on**	**QOL**	**β= 10.44, p=0.001**	24
Anxiety	on	Maintenance	*β*=0.05, p=0.76	**Anxiety**	**on**	**Maintenance**	***β*=−0.43, p=0.01**	37
Anxiety	on	Management	*β*=0.15, p=0.34	Anxiety	on	Management	*β*=−0.22, p=0.23	37

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Patient		Care Partner	Effect	Care Partner		Patient	Effect	Ref
Anxiety	on	Confidence	β=0.03, p=0.87	Anxiety	on	Confidence	β=−0.24, p=0.21	37
Phobic-anxiety	on	HRQOL	β=1.33, p=0.703	**Phobic-anxiety**	**on**	**HRQOL**	**β=14.27, p=0.005**	31
Paranoid ideation	on	HRQOL	β=4.56, p=0.394	Paranoid ideation	on	HRQOL	β=7.22, p=0.150	31
Obsession-compulsion	on	HRQOL	β=0.006, p=0.999	**Obsession-compulsion**	**on**	**HRQOL**	**β=11.27, p<0.001**	31
Hostility	on	HRQOL	β=9.13, p=0.051	**Hostility**	**on**	**HRQOL**	**β=13.25, p=0.033**	31
Sleep disturbances	on	Physical health	β= 0.16, ns	Sleep disturbances	on	Physical health	β= 1.52, ns	25
Sleep disturbances	on	Mental health	β= 0.66, ns	**Sleep disturbances**	**on**	**Mental health**	**β= 2.19, p<0.05**	25
Sleep quality	on	Physical QOL	β=0.00, p=0.956	Sleep quality	on	Physical QOL	β=−0.10, p=0.138	30
Sleep quality	on	Mental QOL	β=−0.04, p=0.492	Sleep quality	on	Mental QOL	β=0.08, p=0.237	30
Maintenance	on	Physical QOL	β=−0.022, p=0.773	Maintenance	on	Physical QOL	β=0.012, p=0.884	27
Maintenance	**on**	**Mental QOL**	**β=0.190, p=0.031**	Maintenance	on	Mental QOL	β=−0.104, p=0.216	27
Management	on	Physical QOL	β=−0.069, p=0.547	Management	on	Physical QOL	β=0.253, p=0.055	27
Management	on	Mental QOL	β=0.003, p=0.980	Management	on	Mental QOL	β=0.259, p=0.076	27
Confidence	on	Physical QOL	β=−0.092, p=0.266	**Confidence**	**on**	**Physical QOL**	**β=−0.306, p=0.002**	27
Confidence	on	Mental QOL	β=−0.067, p=0.469	Confidence	on	Mental QOL	β=−0.048, p=0.627	27
Confidence	on	Maintenance	β= 0.11, p=0.365	Confidence	on	Maintenance	β= 0.12, p=0.071	38

Bold type indicates p-value of <0.05

β refer to slope coefficients and β refer to standardized slope coefficients.

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Table 4:

Empirically-Derived Typologies of Heart Failure Care Dyads

Typology of:	Identified dyadic types and features:	Examples of meaningful correlates:
Dyadic HF Management [56]	**2 dyadic types based on contributions to HF management:** • Collab orative (67.7%): Dyad members contribute similarly • Autonomous (32.3%): Patients more engaged than partners	Patients in "Autonomous" dyads more anxious & depressed & reported worse relationship quality
Dyadic HF Management [85]	**3 dyadic types based on contributions to HF management** • Novice & Complementary (22.4%): Both contribute, but inadequately & to different aspects • Inconsistent & Compensatory (56.4%): Care partners compensate for aspects of self-care patients are not doing adequately • Expert & Collaborative (21.2%): Adequate or higher contributions by both	"Expert & Collaborative" dyads had highest relationship quality & lowest care strain, despite patients having poorest HF-specific QOL
Dyadic HF Symptom Appraisal [41]	**2 dyadic types based on assessment of patient symptoms:** • Patient ≥ Care Partner (61.3%): Patients rate their symptoms similarly or higher than their care partner • Care Partner > Patient (38.7%): Care partners rate patient symptoms higher than patients	Higher care strain in the "Care Partner > Patient" group.Higher patient depression in the "Patient ≥ Care Partner" group
Dyadic HF Knowledge [55]	**2 dyadic types based on level of HF knowledge:** • Knowledgeable Together (74.6%): Dyads with higher, congruent knowledge levels • Knowledge Gap (25.4%): Dyads with lower, more incongruent knowledge levels	Patients in "Knowledge Gap" dyads less likely to adhere to dietary sodium restrictions
Communal Coping *[86]	**3 dyadic types based on use of "we" vs "I" pronouns when discussing HF:** • Congruent & high "we-ratio" (29.6%): Both use high proportion of "we" pronouns • Incongruent "we-ratio" (37.0%): Care partners use high proportion of "we" pronouns, patients use low proportion • Congruent & low "we-ratio" (33.3%): Both use low proportion of "we" pronouns	Care partners in "Congruent & high" dyads had high degree of collaboration, care partners in "Incongruent" dyads felt overwhelmed, underappreciated
Dyadic Relationship Dynamics [87]	**4 dyadic types based on closeness & communication:** • Collaborative (51%): close relationship, frequent communication, HF discussions prioritized • Avoidant (16%): talk but do not visit regularly; HF conversations difficult, avoided • Distant (17%): do not talk or visit often, HF discussions not difficult • Antagonistic (15%): talk & visit often; all communication difficult, particularly HF discussions	Congruence in appraisal of patient depression higher in "Collaborative" & "Distant" dyads. "Avoidant" & "Antagonistic" dyads more incongruent.

* Communal coping: Degree to which dyad members view a problem as "ours" (rather than an individual problem) and communicate/collaborate to address that problem[88]

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Table 5.

Dyadic Randomized Control Trials in Heart Failure

Author, Year, Design, Purpose	Dyad Characteristics	Intervention Description	Results
Agren et al., 2012[59] 2-arm RCT Evaluate the effects of an integrated dyad care program with education and psychosocial support to patients with HF and their partners during a post-discharge period after acute deterioration of HF.	N = 155 dyads (Control = 71, Intervention = 84) Severity of HF: 105 (67.7%) NYHA Class III/IV Age: Patient: 71.0±11.5 years Care partner: 68.5±11.0 years Female: Patients: 38 (24.5%) Care Partners: 117 (75.5%) Relation to patient: Not reported – all cohabitating. Race: Not reported. All participants were from Southeastern Sweden.	Control: Usual care Intervention: Usual care + 3 modules of nurse-led education and psychosocial support delivered over 12 weeks. Key elements included HF knowledge, recognizing factors contributing to stress, changing thoughts and behaviors in a positive manner, and developing problem solving skills related to implementing HF self-care Outcomes: Perceived Control (both), HRQOL (both) Depression (both) HF Self-Care (patient) Care Strain (care partner)	Patient perceived control improved more in the intervention vs. control group at 3 months but not at 12 months. No differences in care partner perceived control between intervention and control at 3 or 12 months. No significant differences between groups in depressive symptoms or quality of life for either patients or care partners at 3 and 12 months. There were no differences in patient self-care or care-related strain between groups at 3 and 12 months.
Agren et al., 2015[64] 2-arm Pilot RCT Evaluate the efficacy of a psychosocial support and education intervention on health, symptoms, and perceived control among post-operative cardiac surgery HF patients and their care partners.	N = 42 dyads (Control =17, Intervention = 25) Severity of HF: EuroSCORE average = 8.8 Age Patient: 69.5±8.7 Care partner: 66.5±7.2 Female: Patients: 4 (9.5%) Care partners: 37 (88.1%) Relationship to patient: Cohabitating partner: 100% Race: Not reported. All participants were from southeastern Sweden.	Control: Usual care Intervention: Usual care + 1 interdisciplinary (physician, nurse, physiotherapist) and 2 nurse-led sessions of education and psychosocial support delivered over 24 weeks. Key elements included eliciting dyads' concerns and goals in handling the rehabilitation phase after surgery, identifying solutions to situations that caused stress, and identifying educational and support needs. Outcomes: HRQOL (both) Depression (both) Perceived Control (both)	No difference in health between intervention and control at 3 and 12 months in patients and care partners. Some within-group improvements in selected HRQOL dimensions for patients and partners observed in the intervention group, but not the control. No difference in depressive symptoms between intervention and control at 3 and 12 months for either patients or partners. Patients in the intervention group had greater improvement in perceived control at 3 and 12 months compared with the control group. No difference in perceived control between intervention and control at 3 and 12 months for care partners.
Dunbar et al., 2013[60] 3-arm RCT Test the efficacy of a HF patient-family partnership intervention designed to reduce dietary sodium and improve medication adherence compared with a patient-family education intervention and usual care.	N = 117 dyads (Control = 53, Patient-Family Education = 59, Family Partnership Intervention = 58) Severity of HF: 32 (27.4%) NYHA Class III/IV Age: Patient: 55.9±10.5 years Care partner: 52.3±33.3 years Female: Patients: 43 (37.0%) Care partners: 97 (83.0%)	Control: Usual care Patient-Family Education (PFE): Dyads attend 2 education sessions focused on medication and dietary adherence, with individual feedback about their medication and diet adherence. Family Partnership Intervention (FPI): PFE interventions + additional 2 sessions on living with HF, principles of autonomy preservation and effective communication, and role playing through self-care support scenarios.	FPI group had significantly lower urinary sodium compared with usual care at 8 months. PFE and FPI groups had significantly lower dietary sodium than usual care at 4 months, but there were no significant group differences at 8 months. At 8 months, the proportion of participants considered to be adherent to dietary sodium (≤2500mg/d) was significantly higher in the FPI group (61.5%) and PFE (53.3%) compared with usual care (27.6%). There was no difference between groups on the outcome

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Author, Year, Design, Purpose	Dyad Characteristics	Intervention Description	Results
	Relationship to patient: Spouse/partner: 62 (52.5%) Adult Child/Sibling: 26 (22.4%) Other: 29 (25.0%) White: Patients: 49 (42.0%) Care Partners: 48 (41.0%) African American: Patients: 67 (58.0%) Care Partners: 69 (59.0%)	Outcomes (patient only): Dietary Sodium (3-day food record and 24-hour urine) Medication Adherence (Medication Events Monitoring System [MEMS] and self-report)	of HF medication adherence (either MEMS or self-report).
Piette et al., 2015[61, 62] 2-arm RCT Determine whether automated feedback to care partners of chronic HF patients impacts caregiving burden and assistance with self-management.	N = 369 dyads (standard mHealth = 180, mHealth+CarePartner [CP] = 189) Severity of HF: Not reported, patients had to be NYHA Class II or III in order to be eligible Age: Patient: 67.9±10.2 years Care partner: 47.1±13.2 years Female: Patients: 3 (0.8%) Care partners: 240 (65.1%) Relationship to patient: (All non-cohabitating) Adult child/child in-law: 224 (60.8%) Friend: 46 (12.4%) Sibling: 35 (9.5%) Other: 64 (17.3%) White: Patients: 285 (77.2%) Care partners: Not reported	Standard mHealth: Weekly automated self-care support calls for 12 months with tailored self-management advice and notifications about problems sent to clinicians. mHealth+CP: Standard mHealth + email report sent to the care partner after each call with patient status information and suggestions for how to support the patient's self-management. Outcomes (patient): HF-Specific QOL (primary) HF Self-Care Medication Adherence Communication w/ Care Partner (frequency, +/− emotions, difficulty) Outcomes (care partner): Care Strain Depressive Symptoms Patient Self-Management Support (hours spent, going to HF visits, help w/ medication adherence)	Patient Outcomes: No difference between groups in patient HF-Specific QOL or HF Self-Care at 6 or 12 months. Higher medication adherence more likely in mHealth+CP arm at both time points. Compared to Standard mHealth, all communication dimensions were more favorable in the mHealth+CP arm, but not at all time points. Care Partner Outcomes (main effects*): Lower care strain in the mHealth+CP group at 6 and 12 months. No difference between groups in depressive symptoms at 6 or 12 months. Significant reduction in hours helping in the mHealth+CP arm at 6 and 12 months. No difference between groups in HF visit attendance or medication adherence help at 6 or 12 months. *Effect modification in the mHealth+CP group by baseline scores for some outcomes, i.e., care partners with higher baseline scores had lower follow-up scores (e.g., strain, depression, hours helping).
Piamjariyakul et al., 2015[65] 2-arm Pilot RCT Test the efficacy of the Fam-HF-care intervention on reducing patient rehospitalization and improving care partner outcomes.	N = 20 dyads (Control = 10, Intervention =10) Severity of HF: Not reported Age: Patient: 62.3±13.5 years Care partner: 61.4±10.0 years Female: Patients: 8 (40.0%) Care partners: 17 (85.0%)	Control: Usual care Intervention (FamHFCare): Usual care + weekly telephone coaching sessions with dyads for 4 weeks. Strategies of coaching included teaching/ teachback of HF home care skills, reinforcing family partnerships with professionals, and motivating care partner involvement in care. Coaching elements were tailored to cultural strengths of African Americans. Outcomes:	Patients in the FamHFCare group had a significant reduction in rehospitalization at 6 months compared with usual care. Care partners in the FamHFCare group had significant improvements in confidence and perceived social support, and significantly lower levels of depressive symptoms at 6 months compared with usual care. There were no significant differences between groups on care burden or preparedness for HF care.

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	Relationship to patient: Spouse: 13 (65.0%) Other family: 7 (35.0%) African American: Patients: 20 (100%) Care partners: (100%)	HF Hospitalizations (patient) Confidence (care partner) Preparedness for HF Care (care partner) Social Support (care partner) Care Burden (care partner) Depression (care partner)	
Srisuk et al., 2017[63] 2-arm RCT Evaluate a heart failure education program developed for patients and care partners in Thailand.	N = 100 dyads (Control = 50, Intervention = 50) Severity of HF: 57 (57.0%) NYHA Class I/II, 43 (43.0%) NYHA Class III (Class IV excluded) Age: Patient: 62.0±16.2 years Care partner: 41.0±10.7 years Female: Patient: 53 (53.0%) Care partner: 73 (73.0%) Relationship to patient: Spouse: 27 (27.0%) Adult Child: 39 (39.0%) Sibling: 26 (26.0%) Parent: 8 (8.0%) Race: Not reported. All participants were from rural Thailand.	Control: Usual care + contact with research personnel (general medical advice, no HF education) equivalent to intervention arm. Intervention: Initial education session focused on HF self-care delivered to the dyad and provision of culturally adapted HF education materials, followed by 15-minute phone calls weekly in the first month, every 2 weeks in the second month, and monthly in months 3–6. Phone calls included scripted reinforcement of HF education, followed by teachback and time for dyad to ask questions. Primary outcomes: HF Knowledge (patient) Perceived Control (care partner) Secondary outcomes: HF Self-Care (patient) HF-Specific QOL (patient) HF Knowledge (care partner) HRQOL (care partner)	Patient and care partner knowledge were higher in the intervention group at 3 and 6 months compared with the control group. Care partners in the intervention group had higher perceived control compared with the control group at 3 but not 6 months. Patient self-care maintenance and self-care confidence were better in the intervention group compared with the control group at 3 and 6 months. Self-care management was better at 6 months only. Patients in the intervention group had better HF-specific QOL compared with the control group at 3 and 6 months. Care partner HRQOL dimensions (physical or mental health) were not significantly different between the groups at either follow-up time point.