Published in final edited form as:

Clin Nurs Res. 2016 August ; 25(4): 362–377. doi:10.1177/1054773815623252.

Effectiveness of Motivational Interviewing in Decreasing Hospital Readmission in Adults With Heart Failure and Multimorbidity

Barbara Riegel, PhD, RN, FAHA, FAAN¹, Ruth Masterson Creber, PhD, RN², Julia Hill, MSN, MPH, RN¹, Jesse Chittams, MS¹, and Linda Hoke, PhD, RN³

¹University of Pennsylvania School of Nursing, Philadelphia, USA

²Columbia University School of Nursing, New York, NY, USA

³Hospital of the University of Pennsylvania, Philadelphia, USA

Abstract

Hospitalizations are common in heart failure (HF). Multimorbidity, defined as 2 comorbid conditions, drives many readmissions. The purpose of this pilot study was to test the effectiveness of motivational interviewing (MI) in decreasing these hospital readmissions. We enrolled 100 hospitalized HF patients into a randomized controlled trial, randomizing in a 2:1 ratio: intervention ($n = 70$) and control ($n = 30$). The intervention group received MI tailored to reports of self-care during one home visit and three to four follow-up phone calls. After 3 months, 34 participants had at least one hospital readmission. The proportion of patients readmitted for a condition unrelated to HF was lower in the intervention (7.1%) compared with the control group (30%, $p = .003$). Significant predictors of a non-HF readmission were intervention group, age, diabetes, and hemoglobin. Together, these variables explained 35% of the variance in multimorbidity readmissions. These preliminary results are promising in suggesting that MI may be an effective method of decreasing multimorbidity hospital readmissions in HF patients.

Keywords

motivational interviewing; self-care; multimorbidity; heart failure

In chronic heart failure (HF), 20% to 25% of patients are readmitted to the hospital within 30 days (Dharmarajan, Hsieh, Lin, Bueno, et al., 2013). By 12 months, 70% have been readmitted (Dharmarajan, Hsieh, Lin, Kim, et al., 2013). Multimorbidity has been identified as a therapeutic target because of the critical role it plays in driving both early and late readmissions in HF (Foraker et al., 2011). Indeed, two thirds of patients readmitted within 30 days are hospitalized for a condition other than HF (Dharmarajan, Hsieh, Lin, Bueno, et

Reprints and permissions: sagepub.com/journalsPermissions.nav

Corresponding Author: Barbara Riegel, Edith Clemmer Steinbright Professor of Gerontology, University of Pennsylvania School of Nursing, 418 Curie Boulevard, Philadelphia, PA 19104-4217, USA. riegel@nursing.upenn.edu.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

al., 2013). Multimorbidity, defined as the coexistence of two or more chronic conditions, is found in 98% of older adults with HF (Salive, 2013). In addition, many chronically ill older adults have complex social and environmental issues (e.g., social isolation, financial stress) that interfere with their abilities to care for themselves (Moraska et al., 2013; Radhakrishnan, Bowles, Hanlon, Topaz, & Chittams, 2013; Retrum et al., 2013). Managing the complexity of multimorbidity and individual patient needs is a priority if we are to control readmissions and costs associated with HF (Tinetti, Fried, & Boyd, 2012). Nonetheless, interventions applicable to multimorbid HF patients are scarce.

In a prior study, we identified significant self-care needs in HF patients with multimorbidity (Dickson, Buck, & Riegel, 2011). Specifically, multi-morbid HF patients reported difficulty with both treatment adherence and symptom management. In another study, we demonstrated that HF patients with better self-care were less likely to be readmitted to the hospital (Lee, Moser, Lennie, & Riegel, 2011). Motivational interviewing (MI) is one method of improving health behaviors (Copeland, McNamara, Kelson, & Simpson, 2015). Thus, the purpose of this pilot study was to test the efficacy of MI in decreasing hospital readmissions in a multimorbid HF population.

Background

MI is a patient-centered therapeutic approach that is effective for people who do not see the importance of change, have no confidence that they can change, or both (Miller & Rose, 2009). MI is used commonly for patients with substance abuse (Engle, 2011; Smedslund et al., 2011), HIV risk behaviors (Foster, McDonald, Frize, Ayers, & Fidler, 2014; Hamrin & McGuinness, 2013; S. Hill & Kavookjian, 2012; Jackson, 2013; Rongkavilit et al., 2014), and psychiatric illness (Balan, Moyers, & Lewis-Fernandez, 2013; Barkhof, Meijer, de Sonnevile, Linszen, & de Haan, 2013). Although not as common, MI is beginning to be used in counseling patients with chronic medical conditions such as diabetes (Chen, Creedy, Lin, & Wollin, 2012; Ribu et al., 2013), asthma (Benzo, 2013), and cardiovascular disease (Thompson et al., 2011) including HF (C. A. Hill, 2009; Paradis, Cossette, Frasure-Smith, Heppell, & Guertin, 2010). For example, Brodie et al. (Brodie & Inoue, 2005) used MI to increase physical activity and quality of life among older adults with HF (Brodie, Inoue, & Shaw, 2008). Ogedegbe and colleagues used MI to improve medication adherence in Black adults with hypertension (G. O. Ogedegbe et al., 2012; G. Ogedegbe et al., 2007).

The goal of MI is to help individuals work through inherent ambivalence present in problematic or unhealthy behaviors and to help them verbally express their own reasons for or against change (Miller & Rose, 2009). Exploring emotions and beliefs with empathy, warmth, and genuineness while supporting self-efficacy enhances the intrinsic motivation to change, thereby reducing ambivalence toward behavior change. MI considers the patient's lived experience of the problem, past successes and failures with changing, and available supports. Knowledge of poor self-care does not, by itself, motivate change. Therefore, rather than demonstrating the clinician's authority with teaching about what *should* be done, MI elicits a range of possible actions and affirms the patient's autonomy to make informed choices. Teaching is done with patient permission. Ambivalence about change is seen as normal. Use of a nonjudgmental approach allows the patient to determine the need for

behavioral change after being helped to see the discrepancies between life goals and current behavior. Realizing and internalizing this opposition between goals and behavior instills a sense of discomfort that ultimately fosters greater motivation for change.

We demonstrated previously that multimorbid HF patients with the best self-care were significantly less likely to be readmitted to the hospital or to die (Lee et al., 2011). In addition, in the main analysis for this study, we demonstrated that patients in the MI intervention group had a significant improvement in self-care over time compared with the usual care group. Thus, in this pilot study, we hypothesized that patients assigned to the MI intervention would experience fewer readmissions than those assigned to the control group.

Method

Study Design

Motivational Interviewing Tailored Interventions for Heart Failure (MITI-HF) was a prospective, single-blinded, randomized controlled trial registered with Clinicaltrials.gov (ID: NCT02177656). The institutional review committee of the university approved the study and all participants provided written informed consent. Enrollment took place between January 2012 and December 2013. A detailed description of study methods including participant eligibility, recruitment procedures, and data collection have been reported elsewhere (Masterson Creber, Patey, DeCesaris et al., 2015) and are summarized briefly here.

Sample

Potential participants were approached during an inpatient HF-related hospitalization at a single University affiliated urban hospital. Patients were included if they had a confirmed diagnosis of chronic symptomatic HF and were able to read and speak English, at least 18 years of age, living in a setting where they could independently engage in self-care (i.e., not in a nursing home) located within driving distance of the research office. Symptomatic status was confirmed using a standardized interview designed to assess New York Heart Association (NYHA) functional class. Patients were excluded if they were on a Milrinone infusion, listed for an implanted ventricular assist device or heart transplant, pregnant, or unable to give informed consent because of psychosis or cognitive impairment. Eligibility was confirmed using a 6-item screener derived from the Mini Mental Status Exam (Callahan, Unverzagt, Hui, Perkins, & Hendrie, 2002).

A power analysis performed using G*Power (Faul, Erdfelder, Buchner, & Lang, 2009) and confirmed with PASS (Fleiss, 1981) revealed that a sample size of 65 participants was adequate for the primary analysis (Masterson Creber, Patey, DeCesaris et al., 2015; Masterson Creber, Patey, Lee, et al., in press); however, 100 hospitalized HF patients were enrolled to account for an anticipated 35% attrition rate, a figure based on our pilot data (Riegel et al., 2006). The target sample size was calculated based on a 2:1 randomization scheme (intervention:control) with 90% power (5% α) to detect a difference of 80% versus 50% (intervention and control group) of achieving a score ≥ 70 indicating adequate self-care on the Self-Care of Heart Failure Index (SCHFI) v.6.2 (Riegel, Lee, Dickson, & Carlson,

2009) at 3 months. This secondary analysis of the data was not addressed in the power analysis.

Procedure

All participants received educational materials addressing self-care behaviors (e.g., exercise, diet) at the time of enrollment. Most participant characteristics (i.e., age, gender, comorbid conditions, prescribed medications, diagnostic lab tests, and echocardiogram results) were obtained from the medical record. Clinical characteristics that were unclear in the medical record (e.g., HF etiology) were adjudicated by a cardiologist. Approximately 2 weeks after hospital discharge, research assistants (blinded to study group allocation) called participants to obtain data on race/ethnicity, insurance status, years of education, and perceived health. Self-care was measured using the SCHFI (Riegel et al., 2009). Participants were randomized to the intervention or control group with a 2:1 randomization ratio. Randomization was performed using minimization (Altman & Bland, 2005), a procedure for balancing groups in small sample sizes by randomizing subjects in strata. In this study, participants were stratified by NYHA functional class and gender as they were randomized.

Following study completion, a research assistant collected health care utilization data from the medical record. Each participant's 3-month enrollment period was examined for inpatient admissions, including events noted as taking place at outlying hospitals. Hospitalizations were classified by a cardiologist as HF-related events or non-HF-related events. HF-related events included admissions for HF as well as those identified in the medical record as complications of HF (e.g., pneumonia secondary to pulmonary edema from volume overload). Participants could have HF-related events, non-HF-related events, or both. Length of stay (LOS) for each hospitalization was calculated using admission and discharge dates.

Intervention

Two registered nurses were hired and trained in MI to avoid the concern that interventionist characteristics influenced intervention effectiveness. Training involved a full day of content and practice, reading assignments, and expert consultation as needed. Individual nurses conducted one home visit and three to four follow-up phone calls to deliver MI to the intervention group (Stawnychy, Masterson Creber, & Riegel, 2014). The nurse delivering the intervention was consistent over time for each individual participant. Prior to meeting with the participant, the nurse interventionist reviewed baseline SCHFI data to identify low-scoring items that could be used in goal setting. Consistent with the basic principles of MI, the session began with identification and resolution of ambivalence regarding specific aspects of self-care. When information was provided by the nurse, it was done with the patient's permission. The conversation then transitioned to action planning with promotion of self-efficacy. Over the follow-up period, the nurse provided support and encouragement during phone conversations.

Control Group

Other than the educational materials addressing self-care behaviors (e.g., exercise, diet) provided to all participants at the time of enrollment, the control group did not receive any intervention over and above usual care.

Data Analysis

An intention to treat approach was used in this analysis. Standard measures of central tendency were used to describe all study variables including the number of hospital readmissions (HF-related, non-HF-related, and all-cause) in each group. Hospitalization was treated as a dichotomous variable (yes/no). A model comparison approach was applied using a stepwise model building process to assess the primary outcome of this study, hospital readmission.

The model included *a priori* factors as well as covariates associated ($p < .05$) with the outcome in bivariate analyses. Variable elimination was done manually using backwards elimination. Factors considered but found to be neither significant nor contributing to the robustness of the model were removed systematically based on p values and measures of model adequacy (AIC/BIC). All analyses were done using StataSE 13.1 (College Station, Texas).

Results

A total of 153 patients provided informed consent for full screening. Of these, 53 patients did not qualify, as described previously (Masterson Creber, Patey, DeCesaris et al., 2015); thus, 100 patients were randomized to a group and included in this analysis. Most participants were male, Black, and educated at a high school level of less. Most described themselves as financially comfortable or having sufficient income to make ends meet. Sociodemographic characteristics of the sample are shown in Table 1. Clinical characteristics are shown in Table 2.

Thirty-four of the 100 participants had one or more hospitalizations over the 3-month follow-up period. Twenty-one of the 70 (30%) intervention group patients and 13 of the 30 (43%) control group patients were readmitted at least once (Table 3). Those readmitted for a non-HF-related reason were more likely to have diabetes and anemia. While there were more HF-related events overall, readmissions related to multimorbidity rather than HF were significantly lower in the intervention group (7.1%) than the control group (30%, $p = .003$). Length of stay did not differ by group for either the first readmission or the second (Table 4).

The final multiple logistic regression model for predictors of a readmission related to multimorbidity included the following four variables: intervention group, age, diabetes, and hemoglobin. Participants in the intervention group had a 94% lower odds of having a non-HF-related readmission ($p = .001$). For each additional year of age, the odds of having a non-HF-related readmission were 7% lower ($p = .007$). Those with diabetes had 6.7 times the odds ($p = .012$) of readmission. Each additional unit of hemoglobin was associated with a 48% lower odds of having a non-HF-related readmission ($p = .006$). These four variables explained 35% of the variance in non-HF-related readmissions.

Discussion

Multimorbidity has been identified as an important contributor to hospital readmission in patients with chronic HF. In this pilot study, we tested the efficacy of MI tailored to self-reported self-care in decreasing the rate of readmissions in a hospitalized HF population. We demonstrated that the MI intervention was a significant, albeit modest, predictor of multimorbidity readmissions. Although the actual number of non-HF-related admissions was small, the results suggest that MI is a promising approach to improving outcomes in this very complex and vulnerable patient population. These results are promising because the best way to manage HF patients with multiple other conditions remains a conundrum. Recent clinical guidelines from the American College of Cardiology and the American Heart Association (ACCF/AHA) note “although there are additional and important comorbidities that afflict patients with HF ... how best to generate specific recommendations remains uncertain, given the status of current evidence” (Writing Committee et al., 2013, p.103).

How might MI have decreased multimorbidity hospitalizations? We noted previously in a meta-synthesis of four mixed methods studies that multimorbidity challenges HF self-care by decreasing self-efficacy (Dickson, Buck, & Riegel, 2013). Self-efficacy, in turn, decreases self-care behaviors. In a later analysis, we demonstrated that better self-care was associated with lower hospitalization rates; however, more comorbidities were associated with lower levels of self-care (Buck et al., 2015). Specifically, comorbidity moderated the relationship between self-efficacy and self-care. As the promotion of self-efficacy is a major element of MI (Resnicow, McMaster, & Rollnick, 2012), we believe that the promotion of self-efficacy may be the mechanism by which our intervention was able to limit non-HF hospitalizations. This was interesting to us because a recent review noted that self-efficacy was not identified as a mechanism of change in MI studies (Copeland et al., 2015).

There is a paucity of interventions shown to reduce hospitalizations in multimorbid HF patients. Interventions for specific disease combinations have been tested (e.g., HF and diabetes; Cha et al., 2012; Dunbar et al., 2014), but approaches for patients with multiple and varied conditions are rare. Transitional care is one approach known to be effective in decreasing readmissions for this population (Naylor et al., 2004). In addition, Accountable Care Organizations are designed to provide cost-effective, clinic-based services for general multimorbid populations (Pauly, 2012). Other approaches such as interdisciplinary primary care (Metzelthin et al., 2013) and interdisciplinary teams for nursing home residents (Rosenberg, 2012) are in the early phases of testing. Two promising interventions for multimorbidity (albeit not focused on HF but still relevant) are patient-centered medical homes (Page et al., 2015) and Guided Care (Boult et al., 2011; Boyd et al., 2007; Leff et al., 2009). However, most of these interventions are labor-intensive. In contrast, a single individual, a registered nurse interventionist, provided this MI intervention during a single home visit with telephone follow-up. If this result is confirmed in a larger trial, MI could prove to be a cost-effective strategy for helping some multimorbid HF patients avoid rehospitalization.

Diabetes and anemia are extremely common comorbid conditions in patients with HF. Not surprisingly, both conditions were significant predictors of a non-HF readmission. We were

surprised, though, that age was a significant predictor, as age did not differ significantly between the groups and, if anything, those hospitalized for a non-HF reason were younger than those not readmitted. It may be that age interacted with diabetes, which occurs at all ages. However, the sample size was too small to test for interactions so this explanation cannot be confirmed.

Limitations

The primary limitation of this pilot study was that we were only able to identify hospitalizations in the primary enrollment site with total certainty. However, we do not believe that we missed hospitalizations as patients were excluded if they lived too far from the enrollment site and records of hospitalizations at other sites were available in the electronic record of the primary site.

Individuals interested in using our research data should contact the first author by email.

Acknowledgments

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

References

- Altman DG, Bland JM. Treatment allocation by minimisation. *British Medical Journal*. 2005; 330(7495):843. [PubMed: 15817555]
- Balan IC, Moyers TB, Lewis-Fernandez R. Motivational pharmacotherapy: Combining motivational interviewing and antidepressant therapy to improve treatment adherence. *Psychiatry*. 2013; 76:203–209. DOI: 10.1521/psyc.2013.76.3.203 [PubMed: 23965260]
- Barkhof E, Meijer CJ, de Sonnevile LM, Linszen DH, de Haan L. The effect of motivational interviewing on medication adherence and hospitalization rates in nonadherent patients with multi-episode schizophrenia. *Schizophrenia Bulletin*. 2013; 39:1242–1251. DOI: 10.1093/schbul/sbt138 [PubMed: 24072808]
- Benzo RP. Mindfulness and motivational interviewing: Two candidate methods for promoting self-management. *Chronic Respiratory Disease*. 2013; 10:175–182. DOI: 10.1177/1479972313497372 [PubMed: 23897933]
- Boult C, Reider L, Leff B, Frick KD, Boyd CM, Wolff JL, ... Scharfstein DO. The effect of guided care teams on the use of health services: Results from a cluster-randomized controlled trial. *Archives of Internal Medicine*. 2011; 171:460–466. DOI: 10.1001/archinternmed.2010.540 [PubMed: 21403043]
- Boyd CM, Boult C, Shadmi E, Leff B, Brager R, Dunbar L, ... Wegener S. Guided care for multimorbid older adults. *The Gerontologist*. 2007; 47:697–704. [PubMed: 17989412]
- Brodie DA, Inoue A. Motivational interviewing to promote physical activity for people with chronic heart failure. *Journal of Advanced Nursing*. 2005; 50:518–527. DOI: 10.1111/j.1365-2648.2005.03422.x [PubMed: 15882368]
- Brodie DA, Inoue A, Shaw DG. Motivational interviewing to change quality of life for people with chronic heart failure: A randomised controlled trial. *International Journal of Nursing Studies*. 2008; 45:489–500. DOI: 10.1016/j.ijnurstu.2006.11.009 [PubMed: 17258218]
- Buck HG, Dickson VV, Fida R, Riegel B, D'Agostino F, Alvaro R, Vellone E. Predictors of hospitalization and quality of life in heart failure: A model of comorbidity, self-efficacy and self-care. *International Journal of Nursing Studies*. 2015; 52:1714–1722. [PubMed: 26234935]

- Callahan CM, Unverzagt FW, Hui SL, Perkins AJ, Hendrie HC. Six-item screener to identify cognitive impairment among potential subjects for clinical research. *Medical Care*. 2002; 40:771–781. DOI: 10.1097/01.mlr.0000024610.33213.c8 [PubMed: 12218768]
- Cha E, Clark PC, Reilly CM, Higgins M, Lobb M, Smith AL, Dunbar SB. Educational needs for improving self-care in heart failure patients with diabetes. *Diabetes Educator*. 2012; 38:673–684. DOI: 10.1177/0145721712450923 [PubMed: 22722611]
- Chen SM, Creedy D, Lin HS, Wollin J. Effects of motivational interviewing intervention on self-management, psychological and glycemic outcomes in type 2 diabetes: A randomized controlled trial. *International Journal of Nursing Studies*. 2012; 49:637–644. DOI: 10.1016/j.ijnurstu.2011.11.011 [PubMed: 22209215]
- Copeland L, McNamara R, Kelson M, Simpson S. Mechanisms of change within motivational interviewing in relation to health behaviors outcomes: A systematic review. *Patient Education and Counseling*. 2015; 98:401–411. DOI: 10.1016/j.pec.2014.11.022 [PubMed: 25535015]
- Dharmarajan K, Hsieh AF, Lin Z, Bueno H, Ross JS, Horwitz LI, ... Krumholz HM. Diagnoses and timing of 30-day readmissions after hospitalization for heart failure, acute myocardial infarction, or pneumonia. *Journal of the American Medical Association*. 2013; 309:355–363. DOI: 10.1001/jama.2012.216476 [PubMed: 23340637]
- Dharmarajan K, Hsieh AF, Lin Z, Kim N, Ross JS, Horwitz LI, ... Krumholz HM. Risks of death and hospital readmission by time following hospitalization for heart failure and acute myocardial infarction. *Circulation: Cardiovascular Quality & Outcomes*. 2013; 6(Suppl 1):abstract 13.
- Dickson VV, Buck H, Riegel B. A qualitative meta-analysis of heart failure self-care practices among individuals with multiple comorbid conditions. *Journal of Cardiac Failure*. 2011; 17:413–419. DOI: 10.1016/j.card-fail.2010.11.011 [PubMed: 21549299]
- Dickson VV, Buck H, Riegel B. Multiple comorbid conditions challenge heart failure self-care by decreasing self-efficacy. *Nursing Research*. 2013; 62:2–9. DOI: 10.1097/NNR.0b013e31827337b3 [PubMed: 23052421]
- Dunbar SB, Butts B, Reilly CM, Gary RA, Higgins MK, Ferranti EP, ... Butler J. A pilot test of an integrated self-care intervention for persons with heart failure and concomitant diabetes. *Nursing Outlook*. 2014; 62:97–111. [PubMed: 24211112]
- Engle B. Review: Motivational interviewing reduces substance use compared with no treatment in substance-dependent individuals. *Evidence-Based Mental Health*. 2011; 14:116.doi: 10.1136/ebmh.2011.100120 [PubMed: 21954156]
- Faul F, Erdfelder E, Buchner A, Lang A. Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*. 2009; 41:1149–1160. [PubMed: 19897823]
- Fleiss, JL. *Statistical methods for rates and proportions*. 2. Toronto, Ontario, Canada: John Wiley; 1981.
- Foraker RE, Rose KM, Suchindran CM, Chang PP, McNeill AM, Rosamond WD. Socioeconomic status, Medicaid coverage, clinical comorbidity, and rehospitalization or death after an incident heart failure hospitalization: Atherosclerosis Risk in Communities cohort (1987 to 2004). *Circulation: Heart Failure*. 2011; 4:308–316. DOI: 10.1161/CIRCHEARTFAILURE.110.959031 [PubMed: 21430286]
- Foster C, McDonald S, Frize G, Ayers S, Fidler S. “Payment by results”—Financial incentives and motivational interviewing, adherence interventions in young adults with perinatally acquired HIV-1 infection: A pilot program. *AIDS Patient Care and STDs*. 2014; 28(1):28–32. DOI: 10.1089/apc.2013.0262 [PubMed: 24428797]
- Hamrin V, McGuinness TM. Motivational interviewing: A tool for increasing psychotropic medication adherence for youth. *Journal of Psychosocial Nursing and Mental Health Services*. 2013; 51(6): 15–18. [PubMed: 23814821]
- Hill CA. Acute heart failure: Too sick for discharge teaching? *Critical Care Nursing Quarterly*. 2009; 32:106–111. DOI: 10.1097/CNQ.0b013e3181a27ccd [PubMed: 19300074]
- Hill S, Kavookjian J. Motivational interviewing as a behavioral intervention to increase HAART adherence in patients who are HIV-positive: A systematic review of the literature. *AIDS Care*. 2012; 24:583–592. DOI: 10.1080/09540121.2011.630354 [PubMed: 22292452]

- Jackson H. Motivational interviewing and HIV drug adherence. *Nursing Times*. Oct; 2013 109(41):21–23. [PubMed: 24288938]
- Lee CS, Moser DK, Lennie TA, Riegel B. Event-free survival in adults with heart failure who engage in self-care management. *Heart & Lung*. 2011; 40:12–20. DOI: 10.1016/j.hrtlng.2009.12.003 [PubMed: 20561885]
- Leff B, Reider L, Frick KD, Scharfstein DO, Boyd CM, Frey K, ... Boulton C. Guided care and the cost of complex healthcare: A preliminary report. *American Journal of Managed Care*. 2009; 15:555–559. [PubMed: 19670959]
- Masterson Creber R, Patey M, Dickson V, DeCesaris M, Riegel B. Motivational interviewing tailored interventions for heart failure (MITI-HF): Study design and methods. *Contemporary Clinical Trials*. 2015; 41:62–68. DOI: 10.1016/j.cct.2014.12.019 [PubMed: 25559913]
- Masterson Creber R, Patey M, Lee CS, Kuan A, Jurgens C, Riegel B. Motivational interviewing to improve self-care for patients with chronic heart failure: MITI-HF randomized controlled trial. *Patient Education and Counseling*. in press. Advance online publication.
- Metzelthin SF, van Rossum E, de Witte LP, Ambergen AW, Hobma SO, Sipers W, Kempen GI. Effectiveness of interdisciplinary primary care approach to reduce disability in community dwelling frail older people: Cluster randomised controlled trial. *British Medical Journal*. 2013; 347:f5264.doi: 10.1136/bmj.f5264 [PubMed: 24022033]
- Miller WR, Rose GS. Toward a theory of motivational interviewing. *American Psychologist*. 2009; 64:527–537. DOI: 10.1037/a0016830 [PubMed: 19739882]
- Moraska AR, Chamberlain AM, Shah ND, Vickers KS, Rummans TA, Dunlay SM, ... Roger VL. Depression, healthcare utilization, and death in heart failure: A community study. *Circulation: Heart Failure*. 2013; 6:387–394. DOI: 10.1161/CIRCHEARTFAILURE.112.000118 [PubMed: 23512984]
- Naylor MD, Broton DA, Campbell RL, Maislin G, McCauley KM, Schwartz JS. Transitional care of older adults hospitalized with heart failure: A randomized, controlled trial. *Journal of the American Geriatrics Society*. 2004; 52:675–684. [PubMed: 15086645]
- Ogedegbe G, Schoenthaler A, Richardson T, Lewis L, Belue R, Espinosa E, ... Charlson ME. An RCT of the effect of motivational interviewing on medication adherence in hypertensive African Americans: Rationale and design. *Contemporary Clinical Trials*. 2007; 28:169–181. DOI: 10.1016/j.cct.2006.04.002 [PubMed: 16765100]
- Ogedegbe GO, Boutin-Foster C, Wells MT, Allegrante JP, Isen AM, Jobe JB, Charlson ME. A randomized controlled trial of positive-affect intervention and medication adherence in hypertensive African Americans. *Archives of Internal Medicine*. 2012; 172:322–326. DOI: 10.1001/archinternmed.2011.1307 [PubMed: 22269592]
- Page TF, Amofah SA, McCann S, Rivo J, Varghese A, James T, ... Williams ML. Care management medical home center model: Preliminary results of a patient-centered approach to improving care quality for diabetic patients. *Health Promotion Practice*. 2015; 16:609–616. DOI: 10.1177/1524839914565021 [PubMed: 25564454]
- Paradis V, Cossette S, Frasure-Smith N, Heppell S, Guertin MC. The efficacy of a motivational nursing intervention based on the stages of change on self-care in heart failure patients. *Journal of Cardiovascular Nursing*. 2010; 25:130–141. DOI: 10.1097/JCN.0b013e3181c52497 [PubMed: 20168193]
- Pauly MV. Accountable care organizations and kidney disease care: Health reform innovation or more same-old, same-old? *American Journal of Kidney Diseases*. 2012; 60:524–529. DOI: 10.1053/j.ajkd.2012.05.019 [PubMed: 22800855]
- Radhakrishnan K, Bowles K, Hanlon A, Topaz M, Chittams J. A retrospective study on patient characteristics and telehealth alerts indicative of key medical events for heart failure patients at a home health agency. *Telemedicine and e-Health*. 2013; 19:664–670. DOI: 10.1089/tmj.2012.0307 [PubMed: 23808888]
- Resnicow K, McMaster F, Rollnick S. Action reflections: A client-centered technique to bridge the WHY-HOW transition in Motivational Interviewing. *Behavioural and Cognitive Psychotherapy*. 2012; 40:474–480. DOI: 10.1017/s1352465812000124 [PubMed: 22414686]

- Retrum JH, Boggs J, Hersh A, Wright L, Main DS, Magid DJ, Allen LA. Patient-identified factors related to heart failure readmissions. *Circulation: Cardiovascular Quality and Outcomes*. 2013; 6:171–177. DOI: 10.1161/CIRCOUTCOMES.112.967356 [PubMed: 23386663]
- Ribu L, Holmen H, Torbjørnsen A, Wahl AK, Grottlund A, Smastuen MC, ... Arsand E. Low-intensity self-management intervention for persons with type 2 diabetes using a mobile phone-based diabetes diary, with and without health counseling and motivational interviewing: Protocol for a randomized controlled trial. *JMIR Research Protocols*. 2013; 2(2):e34.doi: 10.2196/resprot.2768 [PubMed: 23978690]
- Riegel B, Dickson VV, Hoke L, McMahon JP, Reis BF, Sayers S. A motivational counseling approach to improving heart failure self-care: Mechanisms of effectiveness. *Journal of Cardiovascular Nursing*. 2006; 21:232–241. [PubMed: 16699364]
- Riegel B, Lee CS, Dickson VV, Carlson B. An update on the self-care of heart failure index. *Journal of Cardiovascular Nursing*. 2009; 24:485–497. DOI: 10.1097/JCN.0b013e3181b4baa0 [PubMed: 19786884]
- Rongkavilit C, Naar-King S, Koken JA, Bunupuradah T, Chen X, Saengcharnchai P, ... Parsons JT. A feasibility study of motivational interviewing for health risk behaviors among Thai youth living with HIV. *Journal of the Association of Nurses in AIDS Care*. 2014; 25:92–97. DOI: 10.1016/j.jana.2012.02.008 [PubMed: 22683198]
- Rosenberg T. Acute hospital use, nursing home placement, and mortality in a frail community-dwelling cohort managed with Primary Integrated Interdisciplinary Elder Care at Home. *Journal of the American Geriatrics Society*. 2012; 60:1340–1346. DOI: 10.1111/j.1532-5415.2012.03965.x [PubMed: 22694020]
- Salive ME. Multimorbidity in older adults. *Epidemiologic Reviews*. 2013; 35:75–83. DOI: 10.1093/epirev/mxs009 [PubMed: 23372025]
- Smedslund G, Berg RC, Hammerstrom KT, Steiro A, Leiknes KA, Dahl HM, Karlsen K. Motivational interviewing for substance abuse. *Cochrane Database Syst Rev*. 2011; (5):CD008063.doi: 10.1002/14651858.CD008063.pub2 [PubMed: 21563163]
- Stawnychy M, Masterson Creber R, Riegel B. Using brief motivational interviewing to address the complex needs of a challenging patient with heart failure. *Journal of Cardiovascular Nursing*. 2014; 29(5):E1–6. DOI: 10.1097/jcn.0000000000000098 [PubMed: 24231890]
- Thompson DR, Chair SY, Chan SW, Astin F, Davidson PM, Ski CF. Motivational interviewing: A useful approach to improving cardiovascular health. *Journal of Clinical Nursing*. 2011; 20:1236–1244. DOI: 10.1111/j.1365-2702.2010.03558.x [PubMed: 21492271]
- Tinetti ME, Fried TR, Boyd CM. Designing health care for the most common chronic condition—Multimorbidity. *Journal of the American Medical Association*. 2012; 307:2493–2494. DOI: 10.1001/jama.2012.5265 [PubMed: 22797447]
- Yancy CW, Jessup M, Bozkurt B, Butler J, Casey DE Jr. Writing Committee M; American Heart Association Task Force on Practice Guidelines. 2013 ACCF/AHA guideline for the management of heart failure: A report of the American College of Cardiology Foundation/American Heart Association Task Force on practice guidelines. *Circulation*. 2013; 128:e240–e327. DOI: 10.1161/CIR.0b013e31829e8776 [PubMed: 23741058]

Biographies

Barbara Riegel is a Professor in the School of Nursing at the University of Pennsylvania. She is well-known as an expert in heart failure self-care.

Ruth Masterson Creber is a Post-Doctoral Fellow at Columbia University. She collaborated with Dr. Riegel on the conduct of this study while she was a doctoral student at the University of Pennsylvania.

Julia Hill is the Research Project Manager working with Dr. Riegel on various research projects. On this project, she assisted with the collection of data from the electronic medical record.

Jesse Chittams is a Biostatistician in the University of Pennsylvania, School of Nursing. He assisted Dr. Masterson Creber on the analysis of these data.

Linda Hoke is a Clinical Nurse Specialist at the Hospital of the University of Pennsylvania. She is an expert in critical care and heart failure.

Table 1

Baseline Sociodemographic Characteristics, Comparing Participants With and Without a Non-HF Hospitalization.

Variables	Non-HF hospitalization status ($M \pm SD$ or %)			<i>p</i> value
	Overall (<i>n</i> = 100)	No HF hospitalization (<i>n</i> = 86)	1 non-HF hospitalization; total (<i>n</i> = 14)	
Age	60 $\pm$ 14.3	60.8 $\pm$ 14.5	56.7 $\pm$ 13.1	.32
Male	67 (67)	59 (68.6)	8 (57.1)	.40
Study group				
Control group	30 (30)	21 (24.4)	9 (64.3)	.003
Intervention group	70 (70)	65 (75.6)	5 (35.7)	
Race				.79
White	43 (43)	40 (46.5)	3 (21.4)	
Black	57 (57)	46 (53.5)	11 (78.6)	
Education				.56
< high school	64 (64)	56 (65.12)	8 (57.14)	
College/grad school	36 (36)	30 (34.88)	6 (42.86)	
Total years education	13 $\pm$ 2.3	13.2 $\pm$ 2.35	12.8 $\pm$ 1.5	.58
Retired/unemployed	60 (89.55)	23 (88.5)	37 (90.2)	.82
Financial status				.68
Comfortable/enough	69 (69)	60 (69.8)	9 (64.3)	
Not enough	31 (31)	26 (30.2)	5 (35.7)	
Insurance type				.83
Government	69 (69)	59 (68.6)	10 (71.4)	
Commercial/HMO	31 (31)	27 (31.4)	4 (28.6)	
Lives with another	78 (78)	66 (76.7)	12 (85.7)	.45
Support quality				.37
Fair/satisfactory	15 (15)	14 (16.3)	1 (7.1)	
Good/very good	85 (85)	72 (83.7)	13 (92.9)	

Note. HF = heart failure; HMO = health maintenance organization.

Table 2

Baseline Clinical Characteristics, Comparing Participants With and Without a Non-HF Hospitalization.

Variables	Non-HF hospitalization status (<i>M</i> ± <i>SD</i> or %)			<i>p</i> value
	Overall (<i>n</i> = 100)	No HF hospitalization (<i>n</i> = 86)	1 Non-HF hospitalization (<i>n</i> = 14)	
Health perception				.32
Poor/fair	67 (67)	56 (65.12)	11 (78.6)	
Good/very good/excellent	33 (33)	30 (34.9)	3 (21.4)	
Provider specialty				.74
Medicine/cardiology	25 (25)	21 (24.4)	4 (28.6)	
HF specialist	75 (75)	65 (75.6)	10 (71.4)	
NYHA functional class				.37
Class I/II	15 (15)	14 (16.3)	1 (7.1)	
Class III/IV	85 (85)	72 (83.7)	13 (92.9)	
Ejection fraction (%)	36.2 ± 17.5	36.3 ± 17.8	35.4 ± 16.5	.86
Low (1–2)	24 (24)	19 (22.1)	5 (35.1)	
Medium (3–4)	50 (50)	45 (52.3)	5 (35.7)	
High (5–11)	26 (26)	22 (25.6)	4 (28.6)	
Medications (total number)	11.5 ± 5.2	11.5 ± 5.3	11.5 ± 4.5	.99
Beta blocker	84 (84)	72 (83.7)	12 (85.7)	.85
ACE inhibitor	33 (49.3)	11 (42.3)	22 (53.7)	.36
ARB	7 (10.5)	4 (15.4)	3 (7.3)	
Baseline lab values				
Hemoglobin	11.6 ± 1.9	11.8 ± 2.0	10.4 ± 1.2	.01
Creatinine	1.7 ± 1.2	1.7 ± 1.4	2.0 ± 2.2	.29
Comorbid conditions (total)	5.4 ± 2.8	5.6 ± 2.9	4.5 ± 2.1	.19
Hypertension	70 (70)	60 (69.8)	10 (71.4)	.90
Coronary artery disease	21 (21)	10 (23.3)	1 (7.1)	.17
Diabetes	50 (50)	39 (45.4)	11 (78.6)	.02
Depression	6 (6)	5 (5.8)	1 (7.1)	.85
Sleep apnea	12 (12)	11 (12.8)	1 (7.1)	.55

Note. HF = heart failure; NYHA = New York Heart Association; ACE = Angiotensin Converting Enzyme; ARB = Angiotensin II Receptor Blockers.; HMO = health maintenance organization.

Table 3

Number of Study Participants Hospitalized Over the 3-Month Study Period Overall and by Group.

	<u>Overall (%)</u>	<u>Intervention (%)</u>	<u>Usual care (%)</u>	
Variable	<i>n</i> = 100	<i>n</i> = 70	<i>n</i> = 30	<i>p</i> value
HF-hospitalization	24 (24)	18 (26)	6 (20)	.540
Non-HF hospitalization	14 (14)	5 (7.1)	9 (30)	.003

Note. HF = heart failure.

Table 4

Mean Length of Stay Overall and by Group for Study Participants Hospitalized During the 3-Month Study Period.

	Overall	Intervention	Usual care	
	<i>n, M days (SD)</i>	<i>n, M days (SD)</i>	<i>n, M days (SD)</i>	<i>p value</i>
LOS (first readmission)	34, 8.71 (7.45)	21, 10.1 (8.47)	13, 6.46 (4.91)	0.171
LOS (second readmission)	10, 7.70 (7.10)	5, 8.0 (5.14)	5, 7.40 (9.31)	0.903

Note. *n* = number of readmissions; LOS = length of stay; HF = heart failure.