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

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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.

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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 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, multimorbid 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 Sonneville, 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 $\geq$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

Table 1. Baseline Sociodemographic Characteristics, Comparing Participants With and Without a Non-HF Hospitalization.

	Non-HF hospitalization status (*M* ± *SD* or %)			
Variables	Overall (*n* = 100)	No HF hospitalization (*n* = 86)	≥1 non-HF hospitalization; total (*n* = 14)	*p* value
Age	60 ± 14.3	60.8 ± 14.5	56.7 ± 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 ± 2.3	13.2 ± 2.35	12.8 ± 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.

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

Table 2. Baseline Clinical Characteristics, Comparing Participants With and Without a Non-HF Hospitalization.

	Non-HF hospitalization status (*M* ± *SD* or %)			
Variables	Overall (*n* = 100)	No HF hospitalization (*n* = 86)	≥ 1 Non-HF hospitalization (*n* = 14)	*p* value
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.

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

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

	Overall (%)	Intervention (%)	Usual care (%)	
Variable	*n* = 100	*n* = 70	*n* = 30	*p* 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	
	n, M days (*SD*)	*n, M* days (*SD*)	*n, M* days (*SD*)	*p* value
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.

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.

Declaration of Conflicting Interests

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