UCSF
UC San Francisco Previously Published Works

Title

Disease Management in Skilled Nursing Facilities Improves Outcomes for Patients With a Primary Diagnosis of Heart Failure.

Permalink

https://escholarship.org/uc/item/42w6d1s1

Journal

Journal of the American Medical Directors Association, 23(3)

Authors

Weerahandi, Himali
Chaussee, Erin
Dodson, John
et al.

Publication Date

2022-03-01

DOI

10.1016/j.jamda.2021.08.002

Peer reviewed

eScholarship.org Powered by the California Digital Library
University of California

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

HHS Public Access

Author manuscript

J Am Med Dir Assoc. Author manuscript; available in PMC 2023 March 01.

Published in final edited form as:

J Am Med Dir Assoc. 2022 March ; 23(3): 367–372. doi:10.1016/j.jamda.2021.08.002.

Disease Management in Skilled Nursing Facilities Improves Outcomes for Patients with a Primary Diagnosis of Heart Failure

Himali Weerahandi, MD, MPH[a,b,c], **Erin L. Chaussee, PhD**[d], **John A. Dodson, MD, MPH**[c,e], **Mary Dolansky, RN, PhD**[f], **Rebecca S. Boxer, MD, MS**[g,h]

[a]Division of General Internal Medicine and Clinical Innovation, Department of Medicine, NYU Grossman School of Medicine, New York, NY

[b]Division of Healthcare Delivery Science, Department of Population Health, NYU Grossman School of Medicine, New York, NY

[c]Center for Healthcare Innovation and Delivery Science, NYU Langone Health, New York, NY

[d]Department of Medicine, University of Colorado, Aurora, CO

[e]Leon H. Charney Division of Cardiology, Department of Medicine, NYU Grossman School of Medicine, New York, NY

[f]Frances Payne Bolton School of Nursing, Case Western Reserve University, Cleveland, OH

[g]Institute for Health Research, Kaiser Permanente Colorado, Aurora, CO

[h]Division of Geriatric Medicine, University of Colorado, Aurora, CO

Abstract

Objective: Skilled nursing facilities (SNFs) are common destinations after hospitalization for patients with heart failure (HF). Our objective was to determine if patients in SNFs with a primary hospital discharge diagnosis of HF benefit from a HF disease management program (HF-DMP).

Design: This is a sub-group analysis of multi-site, physician/practice blocked, cluster-randomized controlled trial of HF-DMP vs usual care for patients in SNF with a HF diagnosis. The HF-DMP standardized SNF HF care using HF practice guidelines and performance measures and was delivered by a HF nurse advocate.

Setting and Participants: Patients with a primary hospital discharge diagnosis of HF discharged to SNF.

Address for correspondence: Himali Weerahandi, MD, MPH; Department of Medicine, NYU Grossman School of Medicine, 227 East 30th St., New York, NY 10016,USA. Himali.Weerahandi@nyulangone.org, (o) 646-501-9950.

Conflict of Interest Disclosures:

Author Statement: To the best of our knowledge, no conflict of interest, financial or other, exists.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Methods: Composite outcome of all-cause hospitalization, emergency department visits, and mortality were evaluated at 30 and 60-days post SNF admission. Linear mixed models accounted for patient clustering at the physician level.

Results: Of 671 individuals enrolled in the main study, 125 had a primary hospital discharge diagnosis of HF (50 HF-DMP; 75 usual care). Mean age was 79±10, 53% women, mean ejection fraction 46±15%. At 60 days post-SNF admission, the rate of the composite outcome was lower in the HF-DMP group (30%) compared to usual care (52%) (p=0.02). The rate of the composite outcome at 30 days for the HF-DMP group was 18% versus 31% in the usual care group (p=0.11).

Conclusions and Implications: Patients with a primary hospital discharge diagnosis of HF who received HF-DMP while cared for in a SNF had lower rates of the composite outcome at 60 days. Standardized HF management during SNF stays may be important for patients with a primary discharge diagnosis of HF.

Brief summary:

Standardized heart failure management during post-acute skilled nursing facility stays may be important for patients with a primary hospital discharge diagnosis of heart failure.

Keywords

skilled nursing facility; heart failure; post-acute care

Introduction

Skilled nursing facilities (SNFs) are common destinations after hospitalization for patients with heart failure (HF).[1] However, readmissions from SNFs[2] and immediately after SNF discharge to home are common.[3, 4]. While we previously found that a nurse-led HF disease management program (HF-DMP) reduced 60-day readmission and mortality rates from SNFs, it did not reduce the rate of 30- or 60-day composite outcome of all-cause hospitalization, emergency department (ED) visits, and mortality.[5] Identifying patients most likely to benefit from a HF-DMP could help guide SNFs to help maximize its utility and potentially avoid penalties incurred with high 30-day readmission rates.[6, 7]

In this study, we conducted a subgroup analysis of those patients with a primary hospital discharge diagnosis of HF to determine if they may benefit from a HF-DMP in SNFs. We hypothesized that patients with a primary hospital discharge diagnosis of HF receiving HF-DMP in SNFs would have a decreased composite outcome of readmission, ED visits, and mortality compared to those receiving usual care.

Methods

This study was a sub-group analysis of patients with a primary hospital discharge diagnosis of HF who participated in a physician/practice blocked, cluster-randomized controlled trial. Full description of the parent trial design that included both primary and secondary discharge diagnosis of HF, randomization procedures and the HF-DMP intervention have been previously described.[5, 8] Briefly, physician/practices were randomized to either the

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

HF-DMP or usual care; patients within a physician practice were considered a single cluster. This was done to avoid contamination between study groups in the physician practice. SNFs served as blocks to account for within-SNF correlation. Patients were recruited from 47 SNFs with final enrollment from 37 SNFs, most of which were for-profit. Patients from these SNFs represented 59 physicians/practices within the Denver-metropolitan area. The Colorado Multiple Institutional Review Board approved the study.

Patients were eligible for the overall trial if they had a diagnosis of HF, regardless of ejection fraction, and were admitted to SNF following an acute care hospitalization for any cause. Patients were excluded if they came from a long-term care facility prior to hospitalization, had a life-threatening condition with expected mortality within 6-months or less, or on hemodialysis. Patients were eligible for recruitment for the study up to 7-days post SNF admission. Prior to consent, all patients were administered the Brief Interview for Mental Status (BIMS) and the Confusion Assessment Method (CAM) to determine cognitive ability to self-consent. Individuals with a score on the BIMS of ≤12 or who demonstrated delirium as measured by the CAM required consent from a legally authorized representative.

HF-DMP Intervention

The HF-DMP standardized SNF HF care along HF practice guidelines and performance measures and was delivered by a registered nurse called the HF nurse advocate. To accomplish this multipronged intervention, the HF nurse advocate visited enrolled patients randomized to the HF-DMP group three times over seven days and scheduled HF nurse advocate follow up in person or by phone 7-days post SNF discharge.

This intervention was composed of 7-components focused on optimizing HF clinical management: (1) documentation of ejection fraction in the SNF chart; (2) patient symptom and activity assessment; (3) weights taken 3 times in 7 days with lowest sodium dietary recommendation available provided to the patient; (4) recommendations for medication titration; (5) patient/caregiver education on the following topics: (a) recognizing signs and symptoms of HF, (b) daily weight monitoring and documentation, (c) recognizing and understanding HF medications, (d) low sodium diet, and (e) when to call the doctor; (6) discharge instructions; and (7) 7-day post-SNF discharge follow-up.[8] Patient data were collected to ensure care measures were being achieved.

Medication titration recommendations were based on a loop diuretic protocol for weight gain, a blood pressure protocol regardless of ejection fraction, and a protocol for angiotensin converting enzyme-inhibitors, angiotensin receptor blockers and beta blockers for those with reduced ejection fraction HF (HFrEF). The HF nurse advocate would make a recommendation each time a patient reached the threshold for a recommendation until the clinician either indicated that the recommendation would not be adopted or the change was made. For example, if a patient gained 3 pounds in 3 days, a recommendation to increase the diuretic dose would be made until the recommendation was rejected or accepted. Clinicians maintained their clinical judgement as to the best approach for the patient.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Usual Care Group

Physician/practice patients randomized to the usual care group received the usual SNF care. Study research assistants abstracted usual care group patients' charts for the same measures being collected for the HF-DMP group.

Outcomes

The primary outcome of interest was a composite of rehospitalization, ED visits or mortality (whichever occurred first) by 60-days post SNF admission. This captured both the SNF inpatient stay and the SNF post discharge period for most patients. Outcomes were obtained from the SNF chart and a phone call to the participants at 7-days post-SNF discharge and 60-days post-SNF admission. Additionally, the Colorado Regional Health Information Organization was used to identify ED visits and rehospitalizations and the National Death Index was used to confirm death. The addition of these methods was critical to ensure accurate results.[9] Medical records were obtained for each rehospitalization and ED visit. The etiology (HF related, non-HF cardiovascular (CV) related, or other) of the first event (rehospitalization, ED visit, or mortality) was adjudicated by a Clinical Endpoints Committee that was blinded to treatment group.

Secondary outcomes were the composite outcome at 30-days post SNF admission (to capture events occurring within 30 days of hospital discharge); and the difference between HF-DMP and usual care groups' change in health status measured by the Kansas City Cardiomyopathy Questionnaire (KCCQ) and self-care measured by Self-care of HF Index (SCHFI) from baseline to 60-days post-SNF admission. The KCCQ and SCHFI were administered to those deemed cognitively intact, as defined by a score of ≥ 13 on the BIMS.

The KCCQ quantifies physical function, symptoms, social function, self-efficacy, and quality of life for patients with HF.[10] Standardized scores range from 0 to 100, with higher scores indicating better health status.[11] A clinically significant change is 5 points. The SCHFI measures self-care maintenance, self-care management, and self-care confidence.[12] Standardized scores range here also range from 0 to 100, with higher scores indicating better self-care. A clinically significant change in the SCHFI is 8 points.[12]

Statistical Methods

Patients with a primary hospital discharge diagnosis of HF were included in the analysis. Baseline characteristics were compared between those who received HF-DMP versus usual care. Chi-square tests were used for categorical variables, t-tests for normally distributed continuous variables and the Wilcoxon signed-rank test for non-normally disturbed continuous variables. Descriptive statistics described adherence to quantifiable intervention components in the HF-DMP group. Composite event outcomes at 60 days and 30 days post SNF admission were compared with chi-square tests. Linear mixed models were also used to compare outcome rates to account for patient clustering at the physician level using a random effect and correlation within participant via an unstructured covariance matrix.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

For score-based analyses for the KCCQ and SCHFI instruments, patients with incomplete surveys were excluded from the calculation of summary scores. The difference in change in the KCCQ and SCHFI scores from baseline and the 60-day follow-up visit between the usual care and HF-DMP groups were estimated with linear mixed models, which also accounted for patient clustering at the physician level and correlation within participant. Data were analyzed using SAS version 9.4 (SAS Institute, Cary, NC).

Results

Overall, 6689 patients admitted to 47 SNFs were evaluated for study eligibility and of these, 1899 met enrollment criteria. Of those, 671 with a primary or secondary diagnosis of HF were consented and enrolled in the overall study. There were 342 participants enrolled in usual care and 329 in the HF-DMP group. From these enrollees, 125 had a primary hospital discharge diagnosis of HF and were included in the analysis: 75 of the UC cohort participants and 50 of the HF-DMP cohort participants.

Characteristics between those that received HF-DMP vs UC were similar (Table 1). Overall mean age was 79 ± 10 years, 53% women, and mean ejection fraction 46% ± 15%. The number of patients with ejection fraction ≤ 40 on guideline-directed medical therapy were not different between groups at baseline. The average length of SNF stay was not different between the groups (HF-DMP: 19.5 days (12.0-25.0) vs UC: 17.0 days (12.0-23.0), p=0.59), nor was the length of time on the study at the SNF (HF-DMP: 15.0 days (10.0-22.0) vs UC: 13.0 (8.0-20.0), p=0.44).

The HF-DMP group’s adherence to intervention components are in Table 2. Most of these patients had an ejection fraction documented and half had their weight assessed 3 times per 7 days. A total of 41 medication titration recommendations were made by the HF nurse advocate; these include 10 (24%) recommendations followed by the SNF clinician. Most HF-DMP patients completed at least 3 out of the 5 HF education modules, and about half had their discharge instructions reviewed by the HF nurse advocate.

For the primary outcome, the rate of the composite of all-cause hospitalization, ED visits, and mortality at 60-days post-SNF admission was significantly lower in the HF-DMP group compared to the UC group (30% vs 52%, p=0.02). HF-DMP patients experienced fewer events than in the UC group while in SNF (10% vs 22.7%, respectively) and post-SNF discharge (20% vs 29.3%, respectively) (Table 3). Mortality within 60 days was also significantly lower in the HF-DMP group compared to the usual care group (0 [0%] vs 11 [14.7%], respectively, p=0.005). In the HF-DMP group, 11 patients (22%) experienced unplanned readmission within 60 days versus 26 patients (34.7%) in the usual care group (p=0.13). Eight (16%) of the HF-DMP group had an ED visit within 60 days compared to 16 (21.3%) in the usual care group (p=0.46).

The rate of the composite outcome at 30 days for the HF-DMP group was lower than the usual care group, however not statistically significant (18% versus 31%), p=0.11). Four of the usual care patients (5.3%) died within 30 days (vs none in the HF-DMP group, p=0.10). Thirty-day unplanned readmission was experienced by 6 (12%) of the HF-DMP

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

group compared to 15 (20%) patients in the usual care group (p=0.24). Four (8%) HF-DMP patients had an ED visit within 30 days versus 6 (8%) patients in the usual care group (p=1.00).The Clinical Endpoints Committee adjudicated the etiology of the first event and found that the HF-DMP group had one HF related event within 60 days versus 12 HF related events in the UC group.

Sixty-five (86.7%) usual care participants and 43 (86.0%) HF-DMP participants were deemed to be cognitively intact based on their BIMS score and thus eligible to complete KCCQ and SCHFI questionnaires. KCCQ scores increased for both groups at 60 days by more than 5 points in multiple domains but were not statistically significant different between groups (Figure 1). None of the changes in the SCHFI scores between groups were statistically or clinically significant. (Figure 2).

Discussion

In this sub-group analysis of patients whose primary reason for hospitalization was for heart failure, patients in the HF-DMP group had a lower rate of a composite outcome of rehospitalization, ED visits or mortality at 60 days after SNF admission compared to those who received UC. Events occurred at a lower rate in the HF-DMP group both while in SNF and post-SNF discharge, indicating a change that persisted after leaving the SNF. Notably, there were fewer HF related events in the HF-DMP group while rates of “other” first events were similar between groups, which suggests that HF disease management can be an effective approach to improve outcomes. The findings from this sub-group analysis contrasts with the results from the parent trial, which did not find significant differences in 60-day or 30-day composite outcome rates.[5] However, similar to the overall study, mortality within 60-days was significantly lower in the HF-DMP group. Directing HF-DMP in SNF towards post-acute patients whose index hospitalization was primarily for HF may increase the value of this intervention.

Prior work examining post-acute transitional care interventions for HF patients have examined disease management in the outpatient setting or at home,[13] but less is known about how to ideally manage these patients when they are discharged to SNF. Notably, by design the patients enrolled in this study were sicker than typical post-discharge HF patients as these patients were not directly discharged home after hospitalization, and instead required SNF care. Since patients discharged to SNF after HF hospitalization have high rates rehospitalization,[1, 4] directing resources to increase timely clinician attention towards patients with a primary diagnosis of HF is a worthwhile investment for these institutions, particularly since overall HF readmission rates remain high[14] and despite other policy interventions such as the Hospital Readmissions Reduction Program.

Patients with a primary hospital discharge diagnosis of HF (as opposed to those whose HF is just a comorbid condition) are at high risk for post-discharge HF events[15] and thus would be expected to derive greater absolute benefit from an intervention to improve post-acute HF care. We observed improved outcomes with this specialized, targeted management despite a relatively modest intervention where only 24% of the HF nurse advocate medication

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

titration recommendations were followed. If a more intensive SNF-driven intervention was implemented, it is possible that a greater benefit may be observed.

The reason for the low uptake of recommendations requires further study, though we did attempt to determine why providers followed recommendations or not. Unfortunately, in most cases, research staff did not receive a response from the provider on why they did not follow recommended changes. Some responding providers noted that the recommended changes were not medically appropriate or they did not feel comfortable making medication changes when the patient was approaching SNF discharge. While adherence to HF guidelines during hospitalization has been intensely studied,[16, 17] less is known about adherence to HF guidelines at SNF. Our approach may have also been a factor. Although many outpatient HF disease management programs have pre-signed orders which nurses can initiate, especially for diuretic titration based on weight, this was not feasible in the SNF setting. Given the level of patient acuity, co-morbid conditions, frailty and lack of experience with pre-signed orders in SNFs for HF, provider approval was required for new orders. Further work is needed to elucidate SNF provider rationale for not acting on recommendations and to increase support for SNF teams in HF management. The benefit observed in this study may also be driven by the structured educational component of the HF-DMP intervention. It is important for SNFs to strategically target patients at risk for rehospitalization and apply effective approaches to reduce this risk as the Centers for Medicare and Medicaid Services SNF Value-Based Purchasing Program has financial ramifications: SNFs with high 30-day rehospitalization rates face penalties of up to 2% on their Medicare Part A claims.

Limitations

While the main study was a randomized controlled trial, this was a secondary post-hoc analysis of a sub-group of patients with a primary hospital discharge diagnosis of HF. However, patients were similar between the HF-DMP and usual care groups in this subgroup analysis.

Conclusions and Implications

Patient discharge to SNF often is not a choice, but a necessity driven by deconditioning that occurs during hospitalization[1, 18] that precludes discharge home. As our population ages, increasing numbers of patients facing this conundrum will be discharged to SNFs after inpatient stays,[1, 19] particularly such as those with HF who often also have multimorbidity,[20] are medically complex, and thus particularly sensitive to post-hospital syndrome.[21] We found that for patients with a primary hospital discharge diagnosis of HF, a nurse-led HF disease management program in SNFs decreases the risk of a composite outcome of rehospitalization, ED visits or mortality at 60 days after SNF admission. These findings suggest that SNFs should adopt such practices to improve outcomes for this vulnerable group.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Acknowledgments:

We would like to thank the Colorado Medical Directors Association, the physicians and staff who work in nursing homes in the greater Denver metropolitan area and the Colorado Permanente Medical Group for their unwavering support of this work.

Funding Sources:

This project is made possible through grant from the National Heart, Lung, and Blood Institute, National Institutes of Health, NIH 5R01HL113387-02. Dr. Weerahandi is supported through K23HL145110. The National Institutes of Health had no role in design and conduct of the study; collection, management, analysis, or interpretation of the data; or preparation, review or approval of the manuscript.

References

1. Allen LA, Hernandez AF, Peterson ED, et al. Discharge to a Skilled Nursing Facility and Subsequent Clinical Outcomes Among Older Patients Hospitalized for Heart Failure, Circulation.Heart failure 2011;4:293–300. [PubMed: 21447803]
2. Mor V, Intrator O, Feng Z, Grabowski DC. The Revolving Door of Rehospitalization From Skilled Nursing Facilities, Health Aff (Millwood) 2010;29:57–64. [PubMed: 20048361]
3. Toles M, Anderson RA, Massing M, et al. Restarting the cycle: incidence and predictors of first acute care use after nursing home discharge, J Am Geriatr Soc 2014;62:79–85. [PubMed: 24383890]
4. Weerahandi H, Li L, Bao H, et al. Risk of Readmission After Discharge From Skilled Nursing Facilities Following Heart Failure Hospitalization: A Retrospective Cohort Study, Journal of the American Medical Directors Association 2019;20:432–437. [PubMed: 30954133]
5. Boxer RS, Dolansky MA, Chaussee EL, et al. A Randomized Controlled Trial of Heart Failure Disease Management vs Usual Care in Skilled Nursing Facilities, Journal of the American Medical Directors Association 2021;.
6. Centers for Medicare & Medicaid. The Skilled Nursing Facility Value-Based Purchasing Program (SNFVBP), 2017;.
7. Carnahan JL, Unroe KT, Torke AM. Hospital Readmission Penalties: Coming Soon to a Nursing Home Near You! J Am Geriatr Soc 2016;64:614–618. [PubMed: 27000333]
8. Boxer RS, Dolansky MA, Bodnar CA, et al. A randomized trial of heart failure disease management in skilled nursing facilities: design and rationale, J Am Med Dir Assoc 2013;14:710.e5.
9. Daddato AE, Dollar B, Lum HD, et al. Identifying Patient Readmissions: Are Our Data Sources Misleading? Journal of the American Medical Directors Association 2019;20:1042–1044. [PubMed: 31227472]
10. Green CP, Porter CB, Bresnahan DR, Spertus JA. Development and evaluation of the Kansas City Cardiomyopathy Questionnaire: a new health status measure for heart failure, J Am Coll Cardiol 2000;35:1245–1255. [PubMed: 10758967]
11. Heidenreich PA, Spertus JA, Jones PG, et al. Health status identifies heart failure outpatients at risk for hospitalization or death, J Am Coll Cardiol 2006;47:752–756. [PubMed: 16487840]
12. Riegel B, Lee CS, Dickson VV, Carlson B. An update on the self-care of heart failure index, J Cardiovasc Nurs 2009;24:485–497. [PubMed: 19786884]
13. Feltner C, Jones CD, Cene CW, et al. Transitional care interventions to prevent readmissions for persons with heart failure: a systematic review and meta-analysis, Ann Intern Med 2014;160:774–784. [PubMed: 24862840]
14. Centers for Medicare and Medicaid Services. Hospital Compare [https://www.medicare.gov/hospitalcompare/Data/Data-Updated.html#]; Last Updated, 2017; Accessed 9/12/2018, 2017;2018:.
15. Gupta A, Allen LA, Bhatt DL, et al. Association of the Hospital Readmissions Reduction Program Implementation With Readmission and Mortality Outcomes in Heart Failure, JAMA Cardiol 2018;3:44–53. [PubMed: 29128869]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

16. Fonarow GC, Yancy CW, Heywood JT, ADHERE Scientific Advisory Committee, Study Group,and Investigators. Adherence to Heart Failure Quality-of-Care Indicators in US Hospitals: Analysis of the ADHERE Registry, Arch Intern Med 2005;165:1469–1477. [PubMed: 16009861]
17. Smith SC Jr, Fonarow GC, Zhao D. Measuring and Improving the Quality of Heart Failure Care Globally, JAMA Netw Open 2020;3:e1918642–e1918642. [PubMed: 31913486]
18. Kortebein P Rehabilitation for hospital-associated deconditioning, Am J Phys Med Rehabil 2009;88:66–77. [PubMed: 18688198]
19. Dolansky MA, Xu F, Zullo M, et al. Post-Acute Care Services Received by Older Adults Following a Cardiac Event: A Population-Based Analysis, J Cardiovasc Nurs 2010;25:342–349. [PubMed: 20539168]
20. Manemann SM, Chamberlain AM, Boyd CM, et al. Multimorbidity in Heart Failure: Effect on Outcomes, J Am Geriatr Soc 2016;64:1469–1474. [PubMed: 27348135]
21. Krumholz HM. Post-Hospital Syndrome — An Acquired, Transient Condition of Generalized Risk, N Engl J Med 2013;368:100–102. [PubMed: 23301730]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

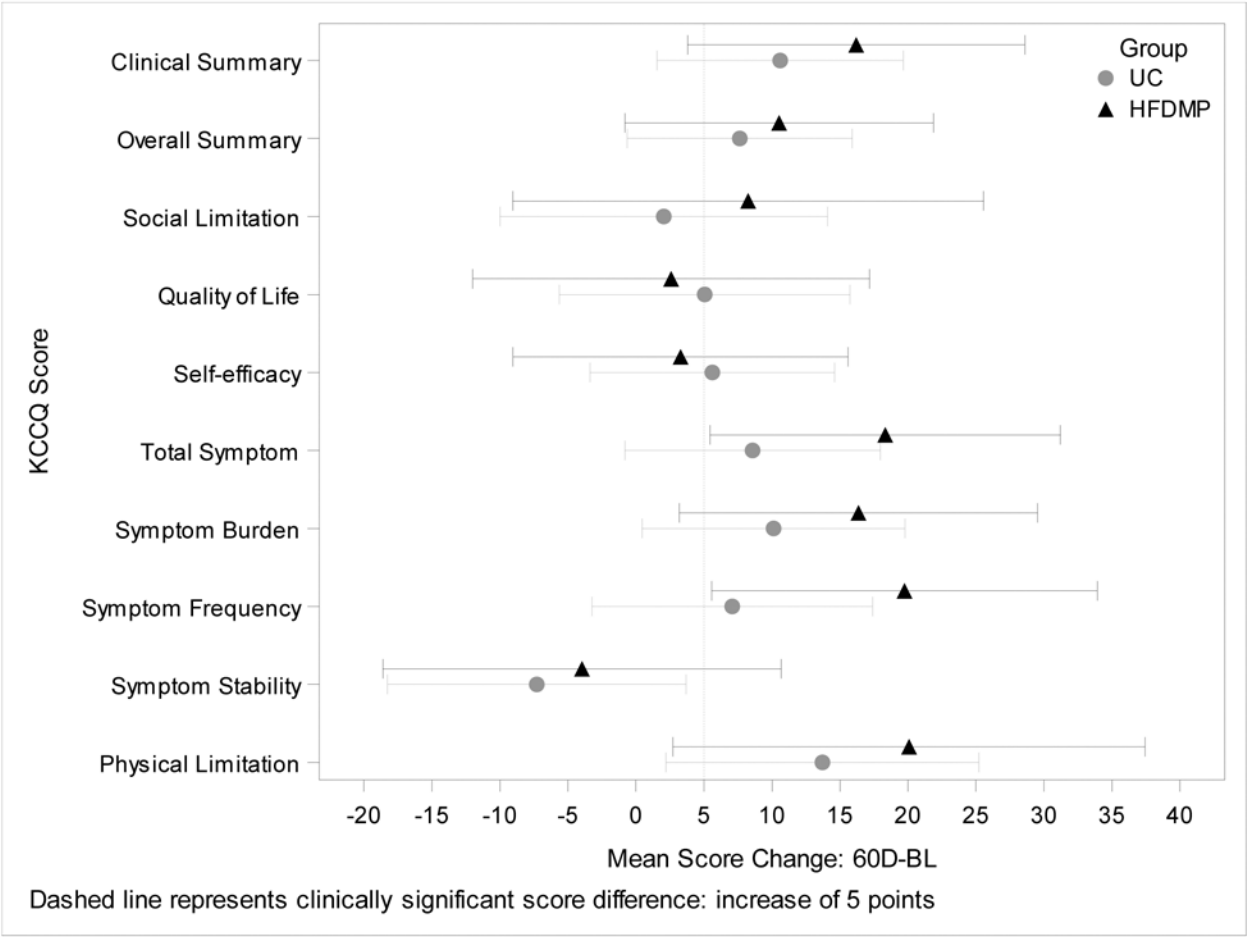

Figure 1. Mean change in KCCQ scores between Usual Care and HF-DMP groups

KCCQ: Kansas City Cardiomyopathy Questionnaire

UC: Usual Care

60D: 60 day

BL: baseline

HFDMP: Heart Failure disease management program

KCCQ baseline completion rate for usual care group: 63/65 (97%), for HFDMP group: 42/43 (98%)

KCCQ 60-day follow up completion rate for usual care group: 31/58 (53%), for HFDMP group: 16/43 (37%)

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

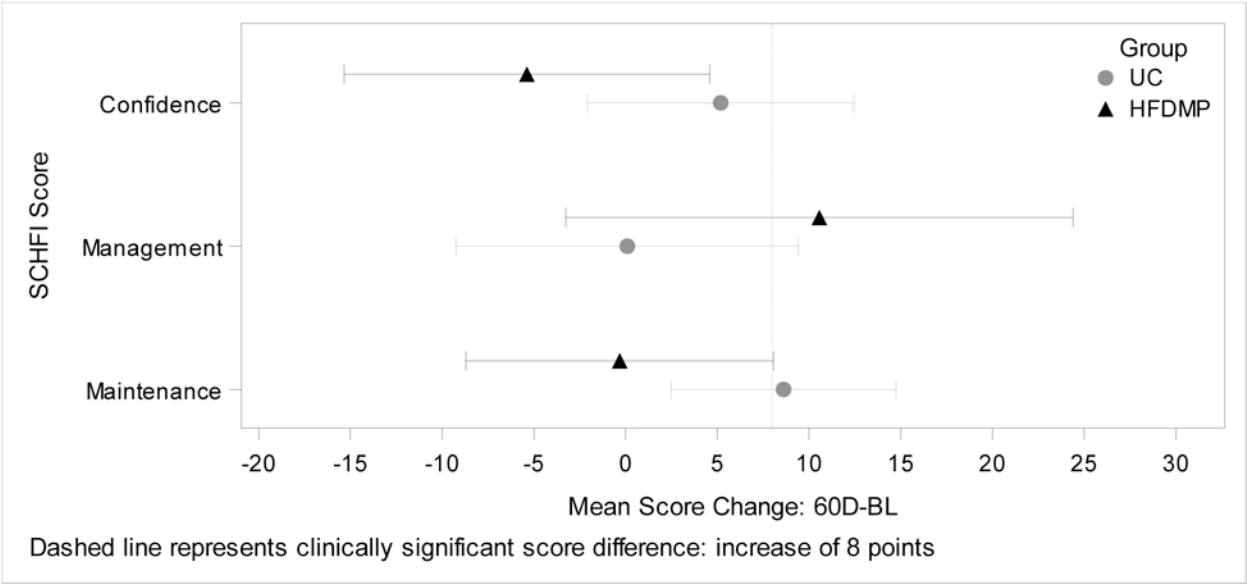

Figure 2. Mean change in SCHFI scores between Usual Care and HF-DMP groups

SCHFI: Self-care of Heart Failure Index

UC: Usual Care

60D: 60 day

BL: baseline

HFDMP: Heart Failure disease management program

SCHFI baseline completion rate for usual care group: 64/65 (98%), for HFDMP group: 42/43 (98%)

SCHFI 60-day follow up completion rate for usual care group: 31/58 (53%), for HFDMP group: 16/43 (37%)

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Table 1.

Participants with a primary hospital discharge diagnosis of heart failure: Characteristics by Intervention Group (n=125)

Characteristic	Intervention Group		Overall (n=125)	p-value
	Usual Care (n=75)	HF-DMP* (n=50)		
Age, mean (SD†)	78.19 (10.42)	80.54 (10.06)	79.13 (10.30)	0.21
Female, n (%)	36 (48.0)	30 (60.0)	66 (52.8)	0.19
Race, n (%)				0.30
Black/African American	7 (9.3)	2 (4.0)	9 (7.2)	
White/Caucasian	65 (86.7)	47 (94.0)	112 (89.6)	
Asian	3 (4.0)	0 (0.0)	3 (2.4)	
American Indian or Alaska Native	0 (0.0)	1 (2.0%)	1 (0.8)	
Ethnicity, n (%)				
Hispanic or Latino	6 (8.0)	6 (12.0)	12 (9.6)	0.46
Education level in years, mean (SD)	14.29 (2.84)	15.36 (8.88)	14.72 (6.02)	0.41
Residence of Origin, n (%)				0.92
Home	62 (82.7)	40 (80.0)	102 (81.6)	
Assisted Living	7 (9.3)	5 (10.0)	12 (9.6)	
Other	6 (8.0)	5 (10.0)	11 (8.8)	
BIMS ‡ Score, n (%)				0.95
Cognitive impairment (0-12)	10 (13.3)	7 (14)	17 (13.6)	
Cognitively intact (13-15)	65 (86.7)	43 (86.0)	108 (86.4)	
Delirium (via CAM §), n (%)	3 (4.0)	5 (10.0)	8 (6.4)	0.18
NYHA ‖ Class				0.96
I/II	43 (57.3)	28 (56.0)	71 (56.8.2)	
III/IV	32 (42.7)	22 (44.0)	54 (43.2)	
Mean Ejection Fraction, mean %, SD	46.1 (15.5)	47.2 (15.0)	46.6 (15.2)	0.69
Ejection Fraction <=40%	27 (37.0)	16 (32.7)	43 (35.2)	0.62
Years with heart failure, mean (SD)	6.4 (9.1)	6.5 (8.4)	6.4 (8.7)	0.96
Charlson Comorbidity Index Total Score, mean (SD)	3.1 (1.5)	3.4 (1.6)	3.23 (1.54)	0.22
Ischemic heart disease, n (%)	42 (56.0)	22 (44.0)	64 (51.2)	0.19
Atrial fibrillation/flutter, n (%)	36 (48.0)	32 (64.0)	68 (54.4)	0.21
Hypertension, n (%)	67 (89.3)	47 (94.0)	114 (91.2)	0.37
Hyperlipidemia, n (%)	43 (57.3)	34 (68.0)	77 (61.6)	0.23
Diabetes Mellitus, n (%)	38 (50.7)	22 (44.0)	60 (48.0)	0.46
Chronic kidney disease, n (%)	38 (50.7)	22 (44.0)	60 (48.0)	0.46
Pulmonary disease, n (%)	43 (57.3)	30 (60.0)	73 (58.4)	0.77
Geriatric Syndromes				
Urinary incontinence, n (%)	16 (21.3)	15 (30.0)	31 (24.8)	0.27

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Characteristic	Intervention Group		Overall (n=125)	p-value
	Usual Care (n=75)	HF-DMP* (n=50)		
History of falls, n (%)	45 (60.0)	29 (58.0)	74 (59.2)	0.82
Hearing Loss, n (%)	33 (44.0)	23 (46.0)	56 (44.8)	0.83
Vision Loss, n (%)	70 (93.3)	48 (96.0)	118 (94.4)	0.53
Osteoporosis, n (%)	20 (26.7)	11 (22.0)	31 (24.8)	0.55
Difficulties with sleep, n (%)	32 (42.7)	33 (66.0)	65 (52.0)	0.01
Unsteady/poor balance, n (%)	58 (77.3)	42 (84.0)	100 (80.0)	0.36
Chronic pain, n (%)	43 (57.3)	26 (52.0)	69 (55.2)	0.56
Medications at baseline in patients with Ejection Fraction ≤ 40	**Usual Care (n=27)**	**HF DMP (n=16)**	**Overall (n=43)**	**p-value**
Ace-inhibitor/Angiotensin II Receptor Blockers, n (%)	14 (51.9)	11 (68.8)	25 (58.1)	0.28
Beta-blocker, n (%)	25 (92.6)	12 (75.0)	37 (86.0)	0.11
Loop diuretic, n (%)	20 (74.1)	12 (75.0)	32 (74.4)	0.95
Digoxin/Lanoxin, n (%)	1 (3.7)	4 (25.0)	5 (11.6)	0.04

*HF-DMP: Heart Failure disease management program

†SD: Standard Deviation

‡BIMS: Brief Interview for Mental Status

§CAM: Confusion Assessment Method

‖NYHA: New York Heart Association

#Data was missing for the following covariates: Ejection Fraction (n=3), Ejection Fraction, Years with HF (n=35)

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Table 2.

HF-DMP Components

Component	HF-DMP* (n=50)
Clinical care measures	
Documentation of Ejection Fraction, n (%)	48 (96)
Patients, n,(%) weighed 3x/7days	25 (50)
Total number of medication titration recommendations given to the clinical team by the HF nurse advocate†	41
Loop diuretic protocol recommendations, n	25
Loop diuretic recommendations followed, n	8
Blood pressure protocol recommendations, n	12
Blood pressure recommendations followed, n	1
Angiotensin converting enzyme-inhibitor/angiotensin receptor blocker protocol recommendations, n	3
Angiotensin converting enzyme-inhibitor/angiotensin receptor blocker recommendations followed, n	0
Beta blocker protocol recommendations, n	1
Beta blocker recommendations followed, n	1
Total Recommendations that were followed, n	10
Discharge care measures	
At least 3 out of 5 heart failure education modules completed ‡n(%)	45 (94)
HF discharge instructions reviewed § n(%)	27 (55)
Follow-up doctor's appointment scheduled n(%)	26 (52)

*HF-DMP: Heart Failure disease management program

†HF nurse advocate recommended mediation titrations based on a loop diuretic protocol for weight gain, a blood pressure protocol regardless of ejection fraction, and a protocol for angiotensin converting enzyme-inhibitor, angiotensin receptor blockers and beta blockers for those with HFrEF. Clinician chose whether or not to follow the recommendations. Total number includes all recommendations made per patient.

‡Per protocol, the HF nurse advocate educated the patient and caregivers in 5 modules during the SNF stay in a preset sequence

§Per protocol the HF nurse advocate reviewed HF discharge instructions with the patient

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Table 3:

Composite Endpoint of Hospitalization, Emergency Department Visit or Mortality at 30- and 60- days post-SNF admission

Measure	Intervention Group			p-value
	Usual Care (N=75)	HF-DMP* (N=50)	Overall (N=125)	
	N(%)			
60-day composite endpoint	39 (52.0)	15 (30.0)	54 (43.2)	0.02
CEC † Review of first event within 60 days				
HF ‡ related	12 (16.0%)	1 (2.0)	13 (10.4)	
CV § related (other than HF)	5 (6.7)	1 (2.0)	6 (4.8)	
Other	19 (25.3)	12 (24.0)	31 (24.8)	
Event not adjudicated	3 (4.0)	1 (2.0)	4 (3.2)	
No event within 60 days	36 (48.0)	35 (70.0)	71 (56.8)	
Timing of first event within 60 days				
No event	36 (48.0)	35 (70.0)	71 (56.8)	
Event while at SNF	17 (22.7)	5 (10.0)	22 (17.6)	
Event post-SNF discharge	22 (29.3)	10 (20.0)	32 (25.6)	
30-day Composite Endpoint	23 (30.7)	9 (18.0)	32 (25.6)	0.11
CEC Review of first event within 30 days				
HF related	8 (10.7)	0 (0.0)	8 (6.4)	
CV related (other than HF)	3 (4.0)	1 (2.0)	4 (3.2)	
Other	11 (14.7)	8 (16.0)	19 (15.2)	
Event not adjudicated	1 (1.3)	0 (0.0)	1 (0.8)	
No event within 30 days	52 (69.3)	41 (82.0)	93 (74.4)	
Timing of first event within 30 days				
No event	52 (69.3)	41 (82.0)	93 (74.4)	
Event while at SNF	15 (20.0)	5 (10.0)	20 (16.0)	
Event post-SNF discharge	8 (10.7)	4 (8.0)	12 (9.6)	

*HF-DMP: Heart Failure disease management program

†CEC: Clinical Endpoints committee

‡HF: Heart Failure

§CV: Cardiovascular