HHS Public Access
Author manuscript
Mayo Clin Proc. Author manuscript; available in PMC 2018 September 13.

Skilled Nursing Facility Use and Hospitalizations in Heart Failure: A Community Linkage Study

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Abstract

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Disclosures: All other authors have no disclosures to report.

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Objective—To examine the impact of skilled nursing facility (SNF) use on hospitalizations among heart failure (HF) patients and to examine predictors of hospitalization among HF patients admitted to a SNF.

Patients and Methods—Olmsted County, MN residents with first-ever HF from 1/1/2000-12/31/2010 were identified and clinical data were linked to SNF utilization data from CMS. Andersen-Gill models were used to determine the association between SNF use and hospitalizations and to determine predictors of hospitalization.

Results—Among 1,498 incident HF patients (mean age 75±14, 45% male), 605 (40.4%) were admitted to a SNF after HF diagnosis (median (min, max) follow-up 3.6 (0-13.0) years). Among those with a SNF admission, 225 (37%) had 2 or more admissions. After adjustment for age, sex, ejection fraction and comorbidities, being in a SNF was associated with a 50% increased risk of hospitalization compared to not being in a SNF (adjusted HR, 95% CI: 1.52, 1.31-1.76). Among SNF users, arrhythmia, asthma, chronic kidney disease, and the number of activities of daily living (ADLs) requiring assistance were independently associated with an increased risk of hospitalization.

Conclusion—Approximately 40% of HF patients were admitted to a SNF at some point after diagnosis. Compared to patients not in a SNF, SNF users were more likely to be hospitalized. Characteristics associated with hospitalization among the SNF users were mostly non-cardiovascular, including reduced ability to perform ADLs. These findings underscore the impact of physical functioning on hospitalizations among HF patients in SNFs and the importance of strategies to improve physical functioning.

Introduction

Heart failure (HF) is a major clinical and public health problem as it affects more than 5 million individuals in the U.S., and more than 550,000 new cases of HF are diagnosed each year.[1,2] The number of patients living with HF continues to rise, and it is estimated that more than 8 million Americans will have HF by the year 2030.[3] HF disproportionately affects the elderly and is prevalent in an estimated 20%-37.4% of the 1.5 to 2 million persons living in a skilled nursing facility (SNF) in the United States.[4]

Although HF is common among persons in SNFs, data on the outcomes for HF patients in SNFs is sparse. Indeed, a recent scientific statement from the American Heart Association underscores that ‘further studies that provide longitudinal data regarding the range of patient experiences after hospital discharge to a SNF are needed’.[4] Addressing this recognized information gap requires comprehensive knowledge of clinical data that can be linked to SNF data in order to obtain the requisite complete longitudinal information and reconstruct the patient experience. These steps are conceptually straightforward but operationally complex and hence seldom executed. Yet, generating such datasets is important to study hospitalizations, a key indicator of HF management. Indeed, while referrals to SNF could be envisioned as a way to reduce hospitalizations, a “revolving door” phenomenon after SNF admission has been hypothesized to drive hospital readmissions,[5] and there is evidence that mortality and hospital readmissions are increased for hospitalized older adults with HF discharged to SNFs compared to those discharged to other sites.[6] The urgent need to study the impact of SNF utilization on hospitalizations in HF was recently emphasized[6,7] but has yet to be carefully examined.

To address these gaps in knowledge, we assembled a community cohort of patients with validated incident (first-ever) HF who were not in a SNF immediately prior to diagnosis. We then created a comprehensive linked dataset including clinical, medical-care use, and SNF information to examine SNF utilization after HF diagnosis, study the impact of SNF use on hospitalizations and examine the predictors of hospitalization among patients admitted to a SNF.

Methods

Study Setting

Our study was conducted among residents in Olmsted County, Minnesota from January 1, 2000 to December 31, 2010. Olmsted County (2010 population: 144,248) is representative of the state of Minnesota and the Upper Midwest region of the US[8] with similar age, sex and ethnic characteristics. Additionally, age- and sex-specific mortality rates are similar for Olmsted County, the state of Minnesota and the entire United States.[8]

Longitudinal, population-based epidemiologic studies in Olmsted County are possible because only a few providers (Mayo Clinic, Olmsted Medical Center and a few private providers) deliver nearly all health care to the local residents.[9,10] The provider-linked medical records from each institution are indexed through the Rochester Epidemiology Project (REP), resulting in the linkage of all detailed clinical (including medical-care use) and demographic information from nearly all sources of care.[8] Thus, the REP constitutes a unique infrastructure for epidemiologic and outcomes studies because the population of Olmsted County is served by a unified medical system with comprehensive clinical records.[9] The data architecture consists of diagnostic and procedure codes that enable case finding to direct medical record review and data collection. Thus, through the REP, HF cases were identified and validated, and clinical data (including hospitalizations) were abstracted from the complete medical record.

Identification of Heart Failure Patients

All Olmsted County in- and outpatients with a diagnosis assigned an *International Classification of Diseases- 9th revision, Clinical Modification* (ICD-9-CM) code 428 from January 1, 2000 to December 31, 2010 were identified.[11] A random sample of 50% of the HF diagnoses between 2000 and 2006 and 100% of HF diagnoses from 2007 to 2010 were manually reviewed. HF diagnoses were validated by experienced nurse abstractors using the Framingham criteria,[12] which is highly reliable.[11] The event was classified as incident if no history of prior HF was found upon review of all sources of information.

Patient Characteristics

We selected the 20 conditions recently identified as a public health priority by the US Department of Health and Human Services[13,14] to classify comorbidities.[15,16] These conditions were ascertained electronically by retrieving ICD-9-CM codes from both inpatient and outpatient encounters at all providers indexed in the REP. As described previously,[15] two occurrences of a code (either the same code or two different codes within the code set for a given disease) separated by more than 30 days and occurring within 5 years prior to the incident HF date were required for diagnosis. Since all patients had HF, this condition was not included. Conditions that were absent (autism, human immunodeficiency virus) or quite infrequent (hepatitis N=9) were also not included, leaving 16 chronic conditions: coronary artery disease (CAD), arrhythmia, stroke, hypertension, hyperlipidemia, diabetes, arthritis, osteoporosis, asthma, chronic obstructive pulmonary disease (COPD), chronic kidney disease (CKD), cancer, depression, dementia, schizophrenia and substance abuse.

Body mass index (BMI) (kg/m^2) was calculated using height at the time of HF diagnosis and weight from the last outpatient visit prior to HF diagnosis. Marital status was ascertained from the medical record.

Echocardiographic examinations were performed within 90 days of HF diagnosis[17] following the recommendations of the American Society of Echocardiography.[18] Ejection fraction (EF) was used to categorize HF into preserved (≥50%) or reduced (<50%) systolic function.[17,19]

Skilled Nursing Facility Data

SNF utilization was obtained through 12/31/2012 from the Centers for Medicare and Medicaid Services (CMS) Long-Term Care Minimum Data Set (MDS) 2.0 and 3.0 assessments.[20] This data set includes all nursing home use regardless of level of care or payer. Consistent with the terminology used in a recent AHA scientific statement, we used the term *skilled nursing facility* to include facilities traditionally called *nursing home*.[4] Thus, we included both post-acute care and long-term use in our analysis of SNF utilization. If a patient was in a SNF and was hospitalized and returned immediately back to the same SNF after discharge, it was counted as one SNF stay, not two. Patients were excluded from the analysis if they were in a SNF within 30 days before their first HF date.

Ability to perform activities of daily living (ADLs) was ascertained from the MDS assessments. Patients are assessed at SNF admission, regularly during their stay, when they experience a change in status and at discharge. Patients are evaluated as to whether they have difficulty performing the following activities on their own: feeding themselves, dressing, using the toilet, housekeeping, bathing and locomotion on the unit (walking or self-sufficient wheeling). Each activity is rated on a scale from 1-5 (1=independent, 2=supervision, 3=limited assistance, 4=extensive assistance, 5=total dependence). We included all assessments on patients in our cohort; thus, we analyzed multiple assessments per person.

Hospitalization Ascertainment

Data regarding all hospitalizations through 12/31/2012 were retrieved from REP resources which, as described previously, include information on all hospital care delivered to Olmsted County residents within the county. In-hospital transfers or transfers between hospitals were counted as a single hospitalization.

Data Management and Statistical Analysis

A longitudinal dataset was generated by linking the comprehensive community medical records of the cohort to the SNF data (Figure 1). Doing so required the creation of timelines that enabled the construction of the chronological time course after diagnosis for each patient, including multiple outpatient clinical evaluations, hospitalizations, and SNF admissions. Patient characteristics, overall and among patients with a SNF admission after HF diagnosis, are presented as frequencies (percent), mean (SD) or median (25^{th}, 75^{th} percentile) as appropriate. Number of SNF admissions for reduced vs. preserved EF was compared with a chi-square test. Age and sex-adjusted rates of time spent in a SNF, expressed as rate of days per person-year, were calculated overall, by age (adjusted for sex), by sex (adjusted for age), and by reduced vs. preserved EF. Differences in the rates were tested with negative binomial regression. Unadjusted and adjusted Andersen-Gill models, a form of the Cox model that models multiple outcomes per person, were used to examine associations between SNF use, modeled as a time-dependent variable, and hospitalization. Models were adjusted for age, sex, EF and comorbidities (modeled as time-dependent variables). Predictors of hospitalization among patients in SNFs were examined using Andersen-Gill models. Potential predictors included age, sex, BMI, EF, marital status, comorbidities (modeled as time-dependent variables) and ADLs. All ADLs that were recorded as part of the SNF stay were obtained and modeled as a time-dependent variable. When analyzing individual ADLs, ratings of “independent” and “supervision” were grouped together as were “extensive assistance” and “total dependence” for ease of interpretation. When analyzing number of ADLs requiring assistance, since few patients did not require any assistance with ADLs (N=89), we grouped together those who required assistance with 0 or 1 ADL. We also grouped together those who required assistance with 2-4 and 5-6 ADLs because of comparable hazard ratios when modeled individually. Models were run for each predictor, adjusted for age and sex; a fully adjusted model including all possible predictors was also run. The proportional hazards assumption was tested using the scaled Schoenfeld residuals and found to be valid.

EF was missing in 17% of the cases, so multiple imputation[21] was employed. Five datasets were created with missing values replaced by imputed values based on a model incorporating various demographic and clinical variables and an indicator for HF along with the cumulative baseline hazard of HF approximated by the Nelson-Aalen estimator.[22] The results of these datasets were then combined using Rubin's rules.[21] All analyses were performed using SAS statistical software, version 9.3 (SAS Institute Inc., Cary, NC). This study was approved by the appropriate Institutional Review Boards.

Results

Patient Characteristics

Among 1,727 patients identified with incident HF from 1/1/2000 to 12/31/2010, 36 (2%) died during their incident HF hospitalization and 193 (11%) were in a SNF at the time of HF or within the 30 days prior. These patients were excluded from further analyses, resulting in a final community cohort of 1,498 patients (mean [SD] age 75.1 [13.7] years, 45% male; 52% preserved EF; Table 1).

During a median (min, max) follow-up of 3.6 (0-13.0) years, 605 (40.4%) patients were admitted to a SNF (mean [SD] age 81.3 [9.3] years, 35% male; 60% preserved EF; Table 1). The proportion of SNF admissions did not change over the study period (P=.34). Among patients admitted to a SNF, a total of 966 SNF admissions occurred with a mean (SD) length of stay per admission of 144.0 (366.9) days. Of the patients admitted to a SNF, 225 (37%) had 2 or more admissions; the maximum number of admissions was 12. Among all patients, those with preserved EF had more SNF admissions compared to those with reduced EF (Figure 2, P<.001).

The overall age- and sex- adjusted rate of days per person-year in a SNF was 19.2. After adjustment for age, no difference in rate of days per person-year in a SNF was observed for women compared to men (21.9 and 16.7 days per person-year, respectively; P=.11). After adjustment for sex, patients aged 75 or older had a higher rate compared to those younger (48.6 vs. 7.2; P<.001). After adjustment for age and sex, the rate of days per person-year in a SNF for patients with preserved EF vs. reduced EF did not differ (20.2 vs. 19.8; P=.92).

SNF and Risk of Hospitalizations

Over a median (min, max) follow-up of 3.6 (0-13.0) years, 688 people died and 5158 hospitalizations occurred among 1219 people. After adjustment for age and sex, residing in a SNF was associated with a 70% increased risk of hospitalization compared to not residing in a SNF (adjusted HR, 95% CI: 1.69, 1.45-1.97). Further adjustment for EF and comorbidities only marginally attenuated these results; residing in a SNF was associated with a 50% increased risk of hospitalization compared to not residing in a SNF (adjusted HR, 95% CI: 1.52, 1.31-1.76).

Predictors of Hospitalization among Patients Admitted to a SNF

Among the 605 patients admitted to a SNF, 518 hospitalizations occurred during the SNF stays. After adjustment for sex, older age was associated with a decreased risk of hospitalization among those in a SNF (HR, 95% CI: 0.96, 0.95-0.98 for a 1 year increase in age, Table 2). After adjustment for age and sex, arrhythmia, asthma, chronic kidney disease and COPD were all associated with a higher risk of hospitalization while being underweight and having dementia were associated with a reduced risk of hospitalization (Table 2).

We then examined ADLs among patients in SNF with at least one complete assessment; 582 patients had a total of 3980 assessments. Extensive assistance/total dependence was highly prevalent for numerous ADLs, with the exception of eating (Table 3). In 2679 (67.3%) assessments, patients required assistance with five or six ADLs. Limitations in the ADLs were associated with an increased risk of hospitalization (Table 3) including assistance or extensive assistance/total dependence in dressing, toileting, getting in and out of bed and locomotion.

We further examined if the number of ADLs for which patients required limited or extensive assistance or total dependence (further referred to as ADLs requiring assistance) was associated with risk of hospitalization. Indeed, an increasing number of ADLs requiring assistance was associated with an increased risk of hospitalization in a dose-response manner (Table 3). Patients with 2-4 ADLs requiring assistance had a 1.6 fold increased risk of hospitalization compared to those with 0-1 ADLs requiring assistance (HR, 95% CI: 1.59, 1.05-2.41, Table 3). Patients who required assistance with 5-6 ADLs had more than a two-fold increased risk of hospitalization compared to patients requiring assistance with 0-1 ADLs (HR, 95% CI: 2.12, 1.41-3.19).

After adjustment for all of the individual predictors, needing assistance with 2-4 or 5-6 ADLs was independently and strongly associated with an increased risk of hospitalization (HR, 95% CI: 1.84, 1.25-2.71; HR, 95% CI: 2.30, 1.55-3.40, respectively; Figure 3). Additional clinical predictors of increased risk of hospitalization included arrhythmia, asthma and chronic kidney disease. Conversely, increasing age, being underweight and having depression or osteoporosis were associated with a decreased risk of hospitalization among patients referred to a SNF (Figure 3).

Discussion

Assembling the aforementioned comprehensive community dataset in a population-based HF incidence cohort enabled characterizing the complete experience of patients living with HF from diagnosis to end of life. We reported that after the first diagnosis of HF, admission to a SNF is frequent, that once admitted to a SNF, the duration of the stay is prolonged (on average 144 days) and that almost 40% of the patients who have been in a SNF will return to a SNF. Patients in a SNF had an increased risk of hospitalization compared to those who did not. Among the patients in a SNF, many non-cardiovascular characteristics, including ADLs, were predictors of hospitalization.

SNF Utilization in HF

Our data pertaining to a comprehensive community cohort of patients with incident (first-ever) HF document that 40% of HF patients are admitted to a SNF at some point after HF diagnosis. Data on this subject are sparse. The study presented herein utilizes longitudinal data on SNF admissions among both in- and outpatient HF patients. Because previous studies relied on administrative data and voluntary registries, only included incident and prevalent hospitalized HF cases, and characterized SNF use at hospital discharge only, the overall utilization of SNF among HF patients was underestimated. Indeed, a study of Medicare fee-for-service hospitalizations for HF found that the utilization of SNF had increased from 13% in 1993 to 20% in 2006.[23] In the Get with the Guidelines–HF (GWTG-HF) program, a voluntary registry of the American Heart Association, approximately 24% of patients hospitalized with HF were discharged to a SNF in 2005 and 2006.[6] The characteristics associated with admission to a SNF in the GWTG-HF study were longer hospital stay, older age, female sex, hypotension, higher EF, no ischemic heart disease and a variety of comorbidities.[6] Our study brings new knowledge to this matter by reporting that the use of SNF in HF patients in the community is more than double what had been previously reported. Indeed, linking clinical data to SNF data including MDS assessments, we reported on all SNF admissions over the course of the entire follow-up and identified that SNF admissions are very frequent in this population as almost half of patients diagnosed with HF are admitted at least once to a SNF during their follow-up. Among those admitted to a SNF, 37% are admitted to a SNF more than once. The proportion of persons admitted to a SNF remained constant over a decade and the length of their stay was prolonged (on average 144 days). A higher proportion of patients with reduced EF had 0 SNF admissions compared to patients with preserved EF. Conversely, a higher proportion of patients with preserved EF had 1, 2, 3, or 4 SNF admissions compared to those with reduced EF. However, a higher proportion of patients with preserved EF are women and older compared to patients with reduced EF. Consequently, we looked at the rate of days per person year in a SNF and after adjusting for age and sex, the rate was similar between those with reduced and preserved EF.

SNF and Hospitalizations

In our cohort, HF patients in a SNF had a 50% increased risk of hospitalization compared to those not in a SNF, independently of comorbidity burden. Prior reports were discrepant as a hospital-level Medicare claims study found no association between SNF rates and 30-day hospital readmission rates[24] while data from the GWTG-HF program indicated that HF patients referred to SNF had an increased risk of death and rehospitalization compared to those discharged home.[6] Our data clearly document an increased risk of hospitalization among patients referred to SNF, even after adjusting for factors contributing to SNF use.

As was recently emphasized, "research is critically needed to understand and ameliorate the multiple factors that contribute to increased mortality and rehospitalizations among patients with HF discharged to SNFs".[7] Since claims data have limitations that hinder adequate adjustment and voluntary registries may suffer from selection bias, our population-based study addresses this gap in knowledge by reporting on a population of optimal clinical relevance with detailed in- and outpatient clinical data linked with CMS MDS data including ADLs, thus capturing the complete experience of patients with rigorously validated incident HF diagnoses. Our linked dataset enabled us to uncover new insights into the predictors of hospitalization among patients with HF admitted to a SNF. Indeed, many non-cardiovascular factors, including the number of ADLs requiring assistance, were associated with an increased risk of hospitalization.

Clinical Implications

These results suggest that intensive transitional care focusing on improving physical function for patients with HF admitted to SNFs could help reduce hospitalizations. Recent evidence suggesting that physical, nutritional and cognitive interventions were effective in reversing frailty in community-dwelling older persons[25] resonate with this point. The healthcare environment and characteristics of persons using SNF are distinct from those of community-dwelling adults; thus, it is important to study the SNF population. Interventions targeted at HF patients in SNFs could lead to different care guidelines and quality measures for patients with HF admitted to SNFs as opposed to patients with HF living independently.[6,7] Indeed, data suggest that providing HF-specific care education to SNF staff may help increase their knowledge and confidence in caring for HF patients.[26] Furthermore, a SNF HF quality initiative program led to better HF care and enhanced teamwork among the SNF staff in addition to improving staff satisfaction.[27]

Limitations and Strengths

Although most nursing homes in the Olmsted County area are SNFs, we could not determine with certainty if a patient was placed into skilled nursing care or intermediate care. Furthermore, we cannot rule out unmeasured confounding. Our study has many notable strengths, including the geographically-defined community setting, rigorous validation of HF cases, and our ability to merge medical record data with MDS data, allowing complete ascertainment of in- and outpatient clinical data as well as SNF utilization after an incident HF diagnosis.

Conclusion

In this community cohort of patients with incident HF, 40% were admitted to a SNF sometime after their diagnosis. Patients in a SNF had a 50% increased risk of hospitalization compared to those not in a SNF. Characteristics associated with hospitalization among the SNF users were mostly non-cardiovascular, including ADLs. This work provides new understanding in the use of SNFs in HF and its impact on hospitalization, which is necessary to plan effective interventions.

Acknowledgments

We thank Ellen Koepsell, RN and Deborah S. Strain for their study support.

Funding Sources: This work was supported by grants from the National Institute on Aging (R21 AG045228 and R01 AG034676) and National Heart Lung and Blood Institute (HL120859). The funding sources played no role in the design, conduct, or reporting of this study.

Dr. Chamberlain is a Co-Investigator of the Rochester Epidemiology Project, funded by a grant from the National Institute on Aging. Dr. Boyd reports grants from NIA during the conduct of the study, and royalty for a chapter on Multimorbidity from UptoDate, outside of the submitted work. Dr. St. Sauver reports grants from National Institute on Aging during the conduct of the study. Dr. Roger reports grants from National Institutes on Aging, grants from National Heart, Lung, Blood, Institute, during the conduct of the study.

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Abbreviations

ADLs	activities of daily living
CAD	coronary artery disease
COPD	chronic obstructive pulmonary disease
HF	heart failure
MDS	minimum data set
REP	Rochester Epidemiology Project
SNF	skilled nursing facility

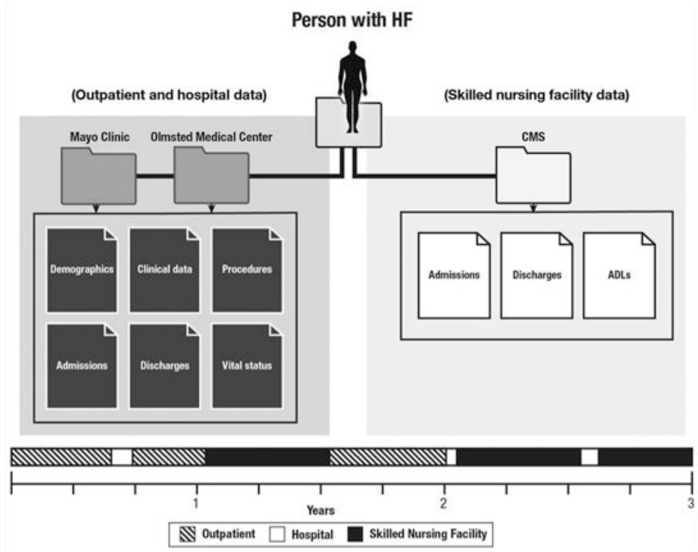

Figure 1.
Linkage of comprehensive community medical records to skilled nursing facility data.

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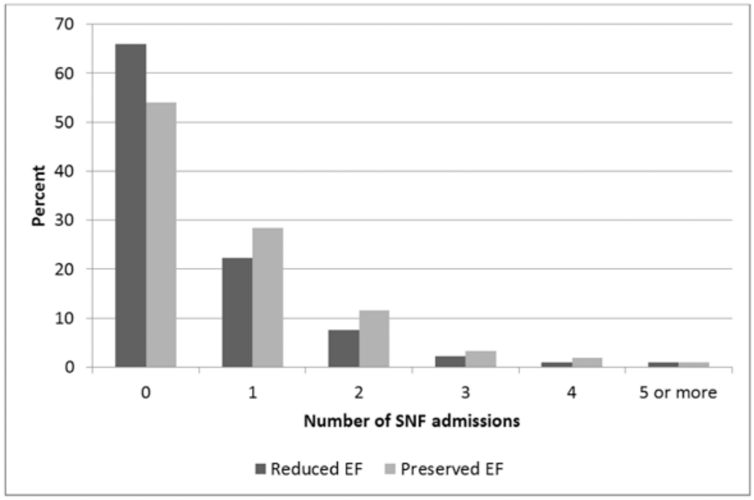

Figure 2.
Number of skilled nursing facility admissions per person after HF diagnosis according to ejection fraction.

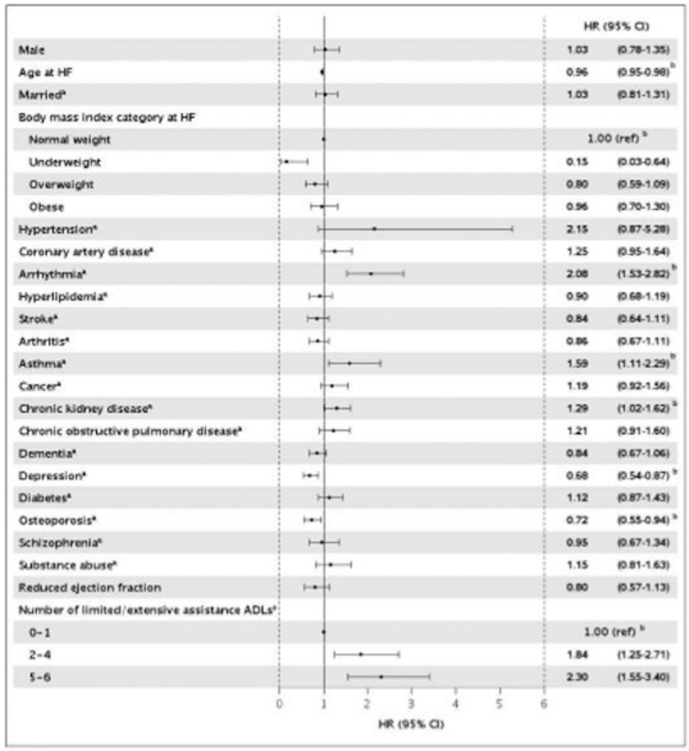

Figure 3.

Fully-adjusted predictors of hospitalizations among heart failure patients in a skilled nursing facility.

[a]Treated as time dependent covariates.

[b]P<.05

ADL=activity of daily living

Table 1

Clinical Characteristics of Incident Heart Failure Patients Overall and among Those with an Admission to A Skilled Nursing Facility after Heart Failure Diagnosis, Olmsted County, 2000-2010

	Overall (N=1498)	Skilled Nursing Facility (N=605)
Male	680 (45.4)	210 (34.7)
Age, mean (SD)	75.1 (13.7)	81.3 (9.3)
Marital status		
Unknown, n	7	0
Not married	754 (50.6)	367 (60.7)
Married	737 (49.4)	238 (39.3)
Body mass index category		
Unknown, n	1	1
Underweight	33 (2.2)	11 (1.8)
Normal	347 (23.2)	175 (29.0)
Overweight	473 (31.6)	189 (31.3)
Obese	644 (43.0)	229 (37.9)
Outpatient at diagnosis	590 (39.4)	220 (36.4)
Prior Hypertension	1346 (89.9)	557 (92.1)
Prior Coronary artery disease	860 (57.4)	353 (58.4)
Prior Arrhythmia	1048 (70.0)	452 (74.7)
Prior Hyperlipidemia	899 (60.0)	339 (56.0)
Prior Stroke	237 (15.8)	112 (18.5)
Prior Arthritis	629 (42.0)	303 (50.1)
Prior Asthma	148 (9.9)	69 (11.4)
Prior Cancer	512 (34.2)	252 (41.7)
Prior Chronic kidney disease	382 (25.5)	164 (27.1)
Prior COPD	401 (26.8)	179 (29.6)
Prior Dementia	143 (9.6)	79 (13.1)
Prior Depression	333 (22.2)	146 (24.1)
Prior Diabetes	588 (39.3)	229 (37.9)
Prior Osteoporosis	243 (16.2)	135 (22.3)
Prior Schizophrenia	46 (3.1)	25 (4.1)
Prior Substance abuse disorder	71 (4.7)	29 (4.8)
Ejection fraction		
Unknown, n	257	105
Reduced	594 (47.9)	202 (40.4)
Preserved	647 (52.1)	298 (59.6)

Data are presented as N (%) unless indicated otherwise.

COPD=chronic obstructive pulmonary disease, eGFR=estimated glomerular filtration rate

Table 2

Age- and Sex-Adjusted Predictors of Hospitalization among Heart Failure Patients in a Skilled Nursing Facility

	HR (95% CI)	*P*
Male	1.15 (0.87-1.54)	.33
Age at HF	0.96 (0.95-0.98)	<.001
Married[a]	1.04 (0.79-1.37)	.77
Normal weight	1.00 (ref)	.01
Underweight	0.23 (0.08-0.69)	
Overweight	0.88 (0.62-1.24)	
Obese	1.18 (0.85-1.62)	
Hypertension[a]	2.24 (0.77-6.47)	.14
CAD[a]	1.26 (0.94-1.69)	.13
Arrhythmia[a]	2.22 (1.61-3.06)	<.001
Hyperlipidemia[a]	1.13 (0.85-1.51)	.41
Stroke[a]	1.21 (0.94-1.57)	.14
Arthritis[a]	0.98 (0.74-1.30)	.91
Asthma[a]	1.77 (1.24-2.53)	.002
Cancer[a]	1.24 (0.93-1.67)	.15
Chronic kidney disease[a]	1.66 (1.30-2.12)	<.001
COPD[a]	1.37 (1.03-1.82)	.03
Dementia[a]	0.74 (0.57-0.96)	.03
Depression[a]	0.80 (0.62-1.04)	.10
Diabetes[a]	1.27 (0.97-1.66)	.09
Osteoporosis[a]	0.80 (0.60-1.08)	.14
Schizophrenia[a]	0.91 (0.62-1.36)	.65
Substance abuse[a]	1.12 (0.75-1.67)	.59
Reduced EF	0.90 (0.65-1.26)	.55

[a]Treated as time-dependent covariates

CAD=coronary artery disease, COPD=chronic obstructive pulmonary disease, EF=ejection fraction, HF=heart failure

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Table 3

Age- and Sex-Adjusted Activities of Daily Living[a] as Predictors of Hospitalization among Heart Failure Patients in a Skilled Nursing Facility

	N	HR (95% CI)	*P*
Eating			.80
Independent/supervision	3159	1.00 (ref)	
Limited assistance	365	1.13 (0.79-1.63)	
Extensive assistance/Total dependence	465	1.04 (0.66-1.65)	
Dressing			<.001
Independent/supervision	559	1.00 (ref)	
Limited assistance	597	2.19 (1.46-3.27)	
Extensive assistance/Total dependence	2824	1.79 (1.28-2.51)	
Bathing			.28
Independent/supervision	140	1.00 (ref)	
Limited assistance	258	1.63 (0.74-3.62)	
Extensive assistance/Total dependence	3582	1.79 (0.87-3.67)	
Toileting			.02
Independent/supervision	702	1.00 (ref)	
Limited assistance	691	1.57 (1.07-2.28)	
Extensive assistance/Total dependence	2587	1.53 (1.11-2.10)	
In/Out bed			.04
Independent/supervision	1014	1.00 (ref)	
Limited assistance	651	1.40 (1.02-1.93)	
Extensive assistance/Total dependence	2315	1.40 (1.05-1.85)	
Locomotion on unit[b]			<.001
Independent/supervision	1018	1.00 (ref)	
Limited assistance	585	1.54 (1.12-2.12)	
Extensive assistance/Total dependence	2377	1.73 (1.32-2.26)	
Number of ADLs requiring assistance[c]			.001
0-1	430	1.00 (ref)	
2-4	871	1.59 (1.05-2.41)	
5-6	2679	2.12 (1.41-3.19)	

[a]Treated as time dependent covariates.

[b]Walking or self-sufficient wheeling.

[c]includes patients requiring limited or extensive assistance or total dependence.

ADL=activity of daily living