Journal of Cardiology xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

Journal of Cardiology

journal homepage: www.elsevier.com/locate/jjcc

Original article

Who are they? Patients with heart failure in American skilled nursing facilities

Lin Li (MD, PhD)[a,*], Bill M. Jesdale (PhD)[a], Anne Hume (PharmD)[b], Giovanni Gambassi (MD)[c], Robert J. Goldberg (PhD)[a], Kate L. Lapane (PhD)[a]

[a] Department of Quantitative Health Sciences, University of Massachusetts Medical School, Worcester, MA, USA
[b] University of Rhode Island College of Pharmacy, Kingston, RI, USA
[c] Department of Medical Sciences, Division of Internal Medicine and Angiology, Catholic University of Sacred Heart, Rome, Italy

ARTICLE INFO

Article history:
Received 19 June 2017
Received in revised form 6 September 2017
Accepted 25 September 2017
Available online xxx

Keywords:
Skilled nursing facility
Heart failure with preserved ejection fraction
Heart failure with reduced ejection fraction
Cross-sectional study

ABSTRACT

Background: Heart failure (HF) is common among skilled nursing facility (SNF) residents, yet patients with HF in the SNF setting have not been well described.
Methods: Using Minimum Data Set 3.0 cross-linked to Medicare data (2011–2012), we studied 150,959 HF patients admitted to 13,858 SNFs throughout the USA. ICD-9 codes were used to differentiate patients with HF with preserved ejection fraction (HFpEF), reduced ejection fraction (HFrEF), or unspecified HF.
Results: The median age of the study population was 82 years, 68% were women, 34% had HFpEF, and 27% had HFrEF. HFpEF patients were older than those with HFrEF. Moderate/severe physical limitations (82%) and cognitive impairment (37%) were common, regardless of HF type. The burden and pattern of common comorbidities, with the exception of coronary heart disease, were similar among all groups, with a median of five comorbidities. One half of patients with HF had been prescribed angiotensin-converting enzyme inhibitors/angiotensin receptor blockers, and 39% evidence-based β-blockers.
Conclusions: SNF residents with HF are old and suffer from significant physical limitations and cognitive impairment and a high degree of comorbidity. These patients differ substantially from HF patients enrolled in randomized clinical trials and that might explain divergence from treatment guidelines.

Introduction

Heart failure (HF) is the leading cause of hospitalization among Americans aged ≥65 years [1], and almost one-fourth of elderly Medicare beneficiaries are discharged to a skilled nursing facility (SNF) after being hospitalized for HF [2,3]. The use of SNF care for patients with HF has steadily increased in recent decades [4]. In 2012, the Readmissions Reduction Program under the Affordable Care Act took effect, which imposes financial penalties on hospitals with excess 30-day readmissions for conditions such as HF [5]. In 2014, the Improving Medicare Post-Acute Care Transformation Act was passed, which intends to shift Medicare payments, including SNF payments, from volume to value [6]. As the population of elderly, high-risk, hospitalized patients with HF expands, and changes in Medicare payment policies gradually take effect, growth in the reliance on SNFs is expected [4].

Although SNFs are a center of transitional care from hospital to home with a focus on rehabilitation, HF is one of the leading causes for potentially preventable re-hospitalizations from SNFs [7,8]. Furthermore, patients with HF discharged to SNFs have an increased risk of mortality compared with those discharged to home [3]. Although HF is common among SNF residents (20–37%), large randomized clinical trials of HF therapy usually exclude SNF residents [9], and no studies have characterized the clinical condition and psychosocial status of SNF patients with HF in sufficient detail to direct patient-focused interventions to reduce unnecessary hospitalizations and mortality [10].

In 2015, the American Heart Association and the Heart Failure Society of America issued the first scientific statement to guide HF management in SNFs, and acknowledged that the epidemiology of HF among SNF residents has not been well described [9]. Therefore, the objectives of this observational study were to describe the clinical and functional characteristics and use of various cardiac

* Corresponding author at: 368 Plantation Street, AS7-2063, Worcester, MA 01605, USA.
E-mail address: lin.li@umassmed.edu (L. Li).

https://doi.org/10.1016/j.jjcc.2017.09.008
0914-5087/

medications among SNF patients with HF, with further stratification according to HF type, using a nationwide dataset including all residents of SNFs in the USA.

Methods

Data sources

We used the Minimum Data Set (MDS) 3.0 cross-linked to the Medicare Beneficiary Summary Files and Medicare Parts A and D. The MDS 3.0 is a federally-mandated comprehensive clinical assessment of all nursing home residents in all Medicare/Medicaid certified facilities. It captures resident-level information on an extensive array of variables including demographics, diagnoses, and physical and psychosocial functioning on admission, quarterly, annually, or following a significant change in the resident's status by trained nursing staff [11]. Extensive studies have confirmed the reliability and validity of common MDS 3.0 items including residents' medical, cognitive, functional, and psychological status [11–16]. The summary files contain beneficiaries' demographic and enrollment information. Medicare Part A contains uniform administrative and clinical elements obtained from discharge abstracts for acute hospital stays of all fee-for-service beneficiaries. Medicare Part D is a prescription drug insurance benefit intended to improve access to essential medications for Medicare beneficiaries. This study was approved by the Institutional Review Board at the University of Massachusetts Medical School.

Study population

In this cross-sectional study, we identified 349,216 non-comatose nursing home residents with a diagnosis of HF at their initial admission MDS assessment, who had continuous co-enrollment in Medicare Part A for at least 3 months preceding admission between April 2011 and September 2012. Among these, 229,915 had been hospitalized for ≤60 days within the 3 months preceding nursing home admission with an inpatient diagnosis of HF [including primary or secondary diagnosis; International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes: 398.91, 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.x]. We subsequently further selected 194,429 residents who had ≥3 months of Part D coverage after the initial nursing home admission. Finally, we identified 150,959 patients with HF admitted to a SNF (not long-stay nursing homes) from 13,858 SNFs (Fig. 1). Individuals who died within the 90-day period after the initial admission were excluded because they did not have ≥3 months of Part D coverage.

Using the inpatient diagnosis of HF during the patient's index hospitalization, namely the most recent hospital admission with a diagnosis of HF prior to the initial SNF admission, HF type was determined to be either HF with preserved ejection fraction (HFpEF; ICD-9-CM codes for diastolic HF: 428.3x), HF with reduced ejection fraction (HFrEF; ICD-9-CM codes for systolic HF: 428.2x or 428.4x), or unspecified HF (ICD-9-CM codes: 398.91, 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.0, 428.1, or 428.9).

Primary diagnosis during the patient's index hospitalization

Because we did not restrict the study population to those with a primary diagnosis of HF, we used the Clinical Classifications Software (CCS) for ICD-9-CM to identify the top 10 medical conditions for the patient's index hospitalization using the primary diagnosis recorded. The CCS "is one in a family of databases and software tools developed as part of the Healthcare Cost and Utilization Project (HCUP), a Federal-State-Industry partnership sponsored by the Agency for Healthcare Research and Quality", which is available to the public [17]. We used the single level CCS rankings for the aggregation of various medical conditions.

Patient characteristics, functional and health status, and comorbidities

We considered sociodemographic characteristics including age (18–64, 65–74, 75–84, and ≥85 years), gender, and race/ethnicity (Hispanics of any race, non-Hispanics who are White, African American, or a residual category of all others) as well as lifestyle risk factors, including body mass index (BMI; <18.5, 18.5 to <25, 25 to <30, and ≥30 kg/m^2), and current smoking status. Physical function was assessed based on the activities of daily living (ADL) score [18], and categorized as either normal or minimal limitations (0–2), moderate limitations (3–4), or severe limitations/dependency (5–6); cognition was measured based on the Centers for Medicare & Medicaid Services definition integrating the self-reported Brief Interview for Mental Status (BIMS) or a staff-reported Cognitive Performance Scale (CPS), and categorized as normal or minimal impairment (BIMS 13–15 or CPS 0–2), moderate impairment (BIMS 8–12 or CPS 3–4), or severe impairment (BIMS 0–7 or CPS 5–6) [13,19,20]. The reliability and validity of the ADL, BIMS, or CPS scores have been demonstrated in comparison with other research instruments [12,16]. We also considered other conditions usually related to aging including signs or symptoms of delirium (based on the Confusion Assessment Method items) [21,22], urinary incontinence, falls in the previous 180 days, and pressure ulcers (stage 1 or above) [23,24]. We considered self- or staff-reported symptoms of dyspnea, diagnosis with cardiovascular comorbidities [including hypertension, coronary heart disease (CHD), cerebrovascular disease, peripheral vascular disease, atrial fibrillation], and non-cardiovascular comorbidities [including hyperlipidemia, diabetes, anemia, chronic obstructive pulmonary disease (COPD)/asthma, depression, renal impairment, dementia (vascular-type dementia or Alzheimer's disease), arthritis, osteoporosis, thyroid disorder, and cancer]. All patient characteristics, functional and health status, and comorbidities, with the exception of atrial fibrillation, were based on information from the initial admission MDS assessment. Because atrial fibrillation was not assessed in MDS, it was based on a discharge diagnosis (ICD-9-CM code: 427.3x) claimed in Part A within 3 months preceding the initial SNF admission.

Receipt of pharmacotherapy

Medications administered during a SNF stay are bundled into the *per diem* cost of the SNF and are not billed to Part D. Therefore, we used part D claims within the 90 days after the SNF admission to define pharmacotherapy use assuming patients would continue their medications even after discharge.

Based on US clinical practice guidelines [25,26], we identified several HF-related medications including angiotensin-converting enzyme inhibitors (ACEIs), angiotensin receptor blockers (ARBs), evidence-based β-blockers (EBBBs, including bisoprolol, carvedilol, and metoprolol succinate extended release), aldosterone antagonists (including spironolactone and eplerenone), nitrates, hydralazine, loop diuretics, thiazides, potassium-sparing diuretics (with the exception of spironolactone and eplerenone), and digoxin. We also ascertained the prescribing of several other cardiac medications, including non-evidence-based β-blockers (all other β-blockers except those included in EBBBs), antiarrhythmic agents (class I and III), calcium channel blockers (including dihydropyridine, diltiazem, and verapamil), renin inhibitors, anticoagulants, and statins. Since aspirin and omega-3 fatty acid supplements are over the counter therapies, we did not have

Please cite this article in press as: Li L, et al. Who are they? Patients with heart failure in American skilled nursing facilities. J Cardiol (2017), https://doi.org/10.1016/j.jjcc.2017.09.008