Incidence and Early Outcomes of Heart Failure in Commercially Insured and Medicare Advantage Patients, 2006 to 2014

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Heart failure (HF) affects >5.7 million individuals in the United States1 with 870,000 individuals newly diagnosed each year.2 Previous epidemiological studies have demonstrated that the incidence of HF varies by race and ethnicity, with the highest incidence in blacks.1–3 However, this association is partially mediated by differences in socioeconomic factors,3 such as access to care, and whether differences extend to commercially insured populations requires examination. Furthermore, although the incidence of HF is known to increase with age,3,4 younger individuals with HF remain understudied because several large epidemiological cohorts5 and claims-based studies6 are restricted to older individuals.

Our goal was to address these gaps in knowledge by leveraging a large US insurance claims database, containing information from >100 million individuals enrolled in private and Medicare Advantage health plans. The objectives of this study were to evaluate the incidence of HF by age, sex, and race/ethnicity and to examine differences in the rate of hospitalizations and office visits in the year after diagnosis.

Methods and Results

Data Source

We conducted a retrospective analysis using the OptumLabs Data Warehouse, a large US commercial insurance database. The database comprises medical claims for individuals in all 50 states and of all ages and ethnic and racial groups. Medical claims include claims for professional (eg, physician), facility (eg, hospital), and outpatient prescription medication services. Pursuant to the Health Insurance Portability and Accountability Act, the use of de-identified data does not require Institutional Review Board approval.

Study Population

We included adult enrollees for whom a diagnosis of HF (International Classification of Diseases, Ninth Revision, Clinical Modification codes 428.XX, 402.X1, 404.X1, or 404.X3) appeared on a single inpatient claim between January 1, 2006 and April 1, 2014. We also included individuals with an HF diagnosis on at least 3 physician or outpatient claims on different days within 20 consecutive months. The incidence date was defined as the earliest discharge date of the qualifying inpatient claim or the latest service date of the qualifying outpatient claim. To ensure that enrollees had newly diagnosed HF, we required them to have at least 2 previous years of continuous medical coverage with no claim listing HF as a diagnosis.

Patient Characteristics

Race was classified as non-Hispanic white (white), non-Hispanic black (black), Asian, or Hispanic based on self-report or derived rule sets. Comorbidities were identified using methods derived by Naessens et al12 based on a modification of the Agency for Healthcare Research and Quality’s Clinical Classification Software method. Enrollees were assigned a comorbidity if it appeared on at least 1 inpatient or 2 outpatient claims in the year before HF diagnosis.

Outcomes

The primary outcomes of interest were all-cause hospitalization and office visits within 1 year after HF diagnosis. For patients hospitalized at initial HF diagnosis, only post diagnosis hospitalizations were analyzed. Reasons for hospitalizations were identified using the primary International Classification of Diseases, Ninth Revision, Clinical Modification and categorized according to the Agency for Healthcare Research and Quality’s Clinical Classifications Software. Office visits were identified by claims where the place of service was reported as office and the Healthcare Common Procedure Coding System code was reported as (99201 to 99205 (new patients), 99211 to 99215 (established patients), or 99241 to 99245 (office consultations). Only one office visit per day was counted. Enrollees were followed until 1 year after diagnosis or censored at disenrollment, whichever came first, through April 1, 2015.

Statistical Methods

Differences in baseline characteristics by race were examined using \( \chi^2 \) test for categorical variables and ANOVA test for continuous variables.
continuous variables. Incidence was calculated as the number of enrollees with incident HF divided by the total person-years among all enrollees. To ensure the denominator had the same restriction as the numerator, only enrollees with at least 2 years of enrollment were included. We used Poisson regression to estimate changes in incidence by age group and to calculate adjusted rates of hospitalization and office visits in the year after HF diagnosis. All analyses were performed using SAS statistical software, version 9.3 (SAS Institute Inc, Cary, NC).

Incidence of HF
Between 2006 and 2014, 123,619 adults were newly diagnosed with HF (Table). In total, 70% of patients were white, 15% were black, 6% were Hispanic, 2% were Asian, and 7% had unknown race/ethnicity. Most blacks resided in the South, and about half of Asians in the Northeast Census regions. The average age at diagnosis was 71.3 years, and black and Hispanic enrollees were younger. In total, 34% were diagnosed with HF in the hospital and 66% in the outpatient setting.

The incidence of HF was 2.1 per 1000 person-years, and was highest among blacks, followed by whites, Hispanics, and Asians (5.5, 2.0, 1.3, and 1.1 per 1000 person-years, respectively). The incidence was higher in men than in women (2.2 versus 2.0 per 1000 person-years, \(P<0.001\)). With advancing age, the incidence increased from <1 per 1000 person-years in those <55 years to 2.9, 4.6, and 21.9 per 1000 person-years in those 55 to 64, 65 to 74, and ≥75 years, respectively (\(P\) for trend<0.001). Across all age groups, the incidence of HF was higher in men and blacks.

Table. Characteristics of Patients With Heart Failure Stratified by Race (2006–2014)

<table>
<thead>
<tr>
<th>Selected conditions</th>
<th>Asian (n=2995)</th>
<th>Black (n=18,424)</th>
<th>Hispanic (n=7308)</th>
<th>White (n=86,413)</th>
<th>Unknown (n=8479)</th>
<th>Total (n=123,619)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes mellitus</td>
<td>1196 (39.9%)</td>
<td>7735 (42.0%)</td>
<td>3167 (43.3%)</td>
<td>29580 (34.2%)</td>
<td>2795 (33.0%)</td>
<td>44473 (36.0%)</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>439 (14.7%)</td>
<td>2902 (15.8%)</td>
<td>1052 (14.4%)</td>
<td>13549 (15.7%)</td>
<td>1286 (15.2%)</td>
<td>19228 (15.6%)</td>
</tr>
<tr>
<td>Hyperlipidemia</td>
<td>1487 (49.6%)</td>
<td>7846 (42.6%)</td>
<td>3461 (47.6%)</td>
<td>38972 (46.0%)</td>
<td>3704 (43.7%)</td>
<td>56310 (45.6%)</td>
</tr>
<tr>
<td>Heart valve disorders</td>
<td>702 (23.4%)</td>
<td>4696 (25.5%)</td>
<td>1845 (25.2%)</td>
<td>24817 (28.7%)</td>
<td>2257 (26.6%)</td>
<td>34317 (27.8%)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>2208 (73.7%)</td>
<td>15442 (83.8%)</td>
<td>5589 (76.5%)</td>
<td>64194 (74.3%)</td>
<td>6080 (71.7%)</td>
<td>93513 (75.6%)</td>
</tr>
<tr>
<td>Coronary atherosclerosis</td>
<td>1259 (42.0%)</td>
<td>6776 (36.8%)</td>
<td>3143 (43.0%)</td>
<td>37847 (43.8%)</td>
<td>3842 (45.3%)</td>
<td>52867 (42.8%)</td>
</tr>
<tr>
<td>Arrhythmias</td>
<td>1207 (40.3%)</td>
<td>6480 (35.2%)</td>
<td>2678 (36.6%)</td>
<td>40433 (46.8%)</td>
<td>3741 (44.1%)</td>
<td>54539 (44.1%)</td>
</tr>
<tr>
<td>Asthma/COPD</td>
<td>556 (18.6%)</td>
<td>4612 (25.0%)</td>
<td>1613 (22.1%)</td>
<td>23999 (27.8%)</td>
<td>2064 (24.3%)</td>
<td>32844 (26.6%)</td>
</tr>
<tr>
<td>Malignancies</td>
<td>298 (9.9%)</td>
<td>1923 (10.4%)</td>
<td>667 (9.1%)</td>
<td>10893 (12.6%)</td>
<td>1223 (14.4%)</td>
<td>15004 (12.1%)</td>
</tr>
<tr>
<td>Kidney disease</td>
<td>314 (10.5%)</td>
<td>2372 (12.9%)</td>
<td>764 (10.5%)</td>
<td>8934 (10.3%)</td>
<td>860 (10.1%)</td>
<td>13244 (10.7%)</td>
</tr>
<tr>
<td>Chronic renal failure</td>
<td>452 (15.1%)</td>
<td>3388 (18.4%)</td>
<td>1034 (14.1%)</td>
<td>12022 (13.9%)</td>
<td>1120 (13.2%)</td>
<td>18016 (14.6%)</td>
</tr>
<tr>
<td>Osteoarthritis</td>
<td>249 (8.3%)</td>
<td>2567 (13.9%)</td>
<td>794 (10.9%)</td>
<td>10912 (12.6%)</td>
<td>987 (11.6%)</td>
<td>15509 (12.5%)</td>
</tr>
<tr>
<td>Dementia</td>
<td>178 (5.9%)</td>
<td>1374 (7.5%)</td>
<td>440 (6.0%)</td>
<td>6583 (7.6%)</td>
<td>588 (6.9%)</td>
<td>9163 (7.4%)</td>
</tr>
<tr>
<td>Depression</td>
<td>103 (3.4%)</td>
<td>982 (5.3%)</td>
<td>418 (5.7%)</td>
<td>6481 (7.5%)</td>
<td>523 (6.2%)</td>
<td>8507 (6.9%)</td>
</tr>
</tbody>
</table>

All values shown are n (%) unless otherwise noted. All characteristics were all significant at the \(P\) value <0.01. COPD indicates chronic obstructive pulmonary disease.
Figure. Adjusted rate of hospitalization and office visits in the first year after heart failure diagnosis. The adjusted rates of hospitalizations by month after incident diagnosis of heart failure are shown by race (A) age group (B), and sex (C). The adjusted rates of office (Continued)
visits by race are shown in **D**. All rates are adjusted for the number of comorbidities. Rates are further adjusted for age, sex, and race/ethnicity where appropriate.
Hospitalizations and Outpatient Visits in the First Year After HF Diagnosis

The mean duration of follow-up was 292 days (maximum 365 and SD, 119.5); 33% did not have a full year of follow-up after HF diagnosis because they disenrolled from their health plan. In total, 43,785 (35%) patients experienced 76,732 hospitalizations in the year after HF diagnosis. The median (25th and 75th percentile) length of stay per hospitalization was 4 (2 and 7) days and was similar by race, age, and sex. The adjusted rate of hospitalizations was highest the first month after diagnosis and then gradually declined. Black patients had the highest rates of hospitalization, whereas Asians had the lowest (Figure A). Older patients had higher rates of hospitalization than younger individuals (Figure B), and women had higher rates than men (Figure C). HF was the most common primary reason for hospitalization (13% of hospitalizations), followed by arrhythmia (5%), sepsis (5%), pneumonia (4%), chronic obstructive pulmonary disease (3%), and acute renal failure (3%). The reasons for hospitalization were similar by race/ethnicity, age, and sex.

There were 1,092,437 office visits (median 9 per person) in the year after HF diagnosis, of which 207,102 (19%) were cardiologist visits. Asians had the highest rates of office visits, whereas blacks had the lowest rates (Figure D). Similar differences in cardiology visits by race/ethnicity were observed.

Comment

In this large commercially insured population, the incidence of HF was highest in blacks, followed by whites, Hispanics, and Asians. Although hospitalization and outpatient visit rates were high initially and gradually declined during the first year in all patient groups, blacks consistently had the highest rates of hospitalization and the lowest rates of outpatient visits.

The incidence of HF in 2010 was 2.1 per 1000 person-years in community adults,14 the same rate found in our population. Epidemiological studies have reported a higher incidence among black patients compared with whites.3,5,15 although data in other races are limited. In the MultiEthnic Study of Atherosclerosis,3 the incidence of HF was highest in blacks, followed by Hispanics, whites, and Chinese Americans. Our findings were similar, with the exception of Hispanics, in whom we found to have a lower incidence of HF compared with whites.

While all patient groups had initially high rates of hospitalization that declined and plateaued during the first year after HF diagnosis, blacks consistently had the highest rates, followed by whites, Hispanics, and Asians. Our findings augment previous reports of higher rates of HF hospitalization in blacks than in whites, by providing comparative rates in Hispanics and Asians, and delineating that racial differences persist throughout the first year after HF diagnosis. Despite having the highest rates of hospitalization, blacks had the lowest rates of outpatient visits after diagnosis, demonstrating that differential utilization of office visits by race persists in this commercially insured population. Further work is needed to identify barriers to outpatient care for blacks because more effective disease management may result in fewer hospitalizations.19

There are some limitations to acknowledge. First, these findings are from the a US commercially insured population, and results from other populations may differ. Second, we only captured hospitalizations occurring while patients remained enrolled in the health plan. Finally, reliance on billing codes for identification of HF and comorbidities may result in misclassification. However, there are several notable strengths. We included patients from across the US; all ages, racial and ethnic groups, and both sexes were represented in a similar distribution to other large national studies.20,21 In addition to describing incidence by race, we reported novel data on the rate of hospitalizations and outpatient visits in the year after HF diagnosis. We included outcomes through mid-2015, which are integral to understanding the current state of HF in the US.

In summary, among a commercially insured population, black patients had the highest incidence of HF and rates of hospitalization after diagnosis, but the lowest rate of outpatient visits. These data may provide impetus for thoughtful improvements in access to and utilization of care among different racial and ethnic groups.

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Disclosures

None.

References


Key Words: association • heart failure • hospitalization • incidence • socioeconomic factors