Heart Failure Associated Hospitalizations in the United States

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Abstract

Objective—We sought to characterize temporal trends in hospitalizations with heart failure as a primary or secondary diagnosis.

Background—Heart failure patients are frequently admitted for both heart failure and other causes.

Methods—Using the Nationwide Inpatient Sample (NIS), we evaluated trends in heart failure hospitalizations between 2001 and 2009. Hospitalizations were categorized as either primary or secondary heart failure hospitalizations based the location of heart failure in the discharge diagnosis. National estimates were calculated using the sampling weights of the NIS. Age- and gender-standardized hospitalization rates were determined by dividing the number of hospitalizations by the United States population in a given year and using direct standardization.

Results—The number of primary heart failure hospitalizations in the United States decreased from 1,137,944 in 2001 to 1,086,685 in 2009, while secondary heart failure hospitalizations increased from 2,753,793 to 3,158,179 over the same period. Age- and gender-adjusted rates of primary heart failure hospitalizations decreased steadily over 2001–2009, from 566 to 468 per 100,000 people. Rates of secondary heart failure hospitalizations initially increased, from 1370 to 1476 per 100,000 from 2001–2006, then decreased to 1359 per 100,000 in 2009. Common primary diagnoses for secondary heart failure hospitalizations included pulmonary disease, renal failure, and infections.

Conclusions—Although primary heart failure hospitalizations declined, rates of hospitalizations with a secondary diagnosis of heart failure were stable in the past decade. Strategies to reduce the high burden of hospitalizations of heart failure patients should include consideration of both cardiac disease and non-cardiac conditions.

Keywords

Heart failure; hospitalizations; comorbidity

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Heart failure is among the most common reasons for hospital admission in the United States. Given this substantial morbidity, efforts have been made to reduce the number of hospitalizations related to this disease. A number of therapies have been developed over the past two decades which have been shown to reduce heart failure hospitalizations (1–8) and quality improvement initiatives have been developed to ensure delivery of these evidence-based therapies. (9,10) To encourage such initiatives, the Center for Medicare and Medicaid Services began reporting on the quality of care and rate of heart failure rehospitalization for hospitals. (11)

The development of evidence-based treatments and initiatives to improve care delivery may be improving outcomes for patients. For example, while studies demonstrated that the rates of heart failure hospitalizations increased in the 1980s and 1990s, (12,13) recent data from Medicare indicate that hospitalizations with a primary diagnosis of heart failure in the elderly have declined over the last decade. (14) These findings were attributed to both improvements in treatment and reduction in prevalent heart failure. (14) Nonetheless, the majority of hospitalizations of heart failure patients are for reasons other than acute heart failure, (15,16) and quality improvement initiatives typically target only hospitalizations with a primary diagnosis of heart failure so may not impact comorbid conditions which are associated with, but not directly caused by, heart failure. We sought to evaluate recent trends in primary and secondary heart failure hospitalizations in the United States using an all-payer, representative survey of inpatient admissions.

Methods

The Nationwide Inpatient Sample (NIS) is part of the Healthcare Cost and Utilization Project (HCUP), sponsored by the Agency for Healthcare Research and Quality (AHRQ). (17) The NIS represents the largest all-payer hospitalization database in the United States and samples approximately 8 million hospitalizations per year to represent national estimates.

We included all heart failure hospitalizations between 2001 and 2009 for individuals aged 18 years. The primary unit of analysis was a patient hospitalization. Individual patients cannot be tracked longitudinally in the NIS, thus an individual may have contributed to more than one observation in a given year. Heart failure was based on the following International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) discharge diagnosis codes in any position: 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, and 428. (18) If one of these codes was listed in the first position, the admission was considered to be a primary heart failure hospitalization; otherwise, the admission was considered to be a secondary heart failure hospitalization. The NIS abstracts up to 15 discharge diagnosis codes, although actual hospitalizations may list more diagnoses. (17)

All patient and hospital characteristics were obtained from the NIS. Patient characteristics included demographic and outcome characteristics and comorbidities. Age was presented as a continuous variable and categorized as 18–49, 50–64, 65–74, 75–84, and 85 years. Race was categorized as white, black, or other. The primary payer for the hospitalization was categorized as Medicare, Medicaid, private insurance, self-pay, or other. Number of chronic conditions was defined by summing the Elixhauser comorbidity index, (19) and individual comorbidities were assessed using the HCUP Clinical Classification Software (CCS) definitions. (20) Hospital characteristics included region of the country and rural versus urban density. Region of the country was categorized as Northeast, Midwest, South, or West. Rural region was based on Metropolitan Statistical Area codes prior to 2004 and Core Based Statistical Area codes beginning in 2004. (17)

Hospitalization type was based on principal discharge diagnosis. We categorized hospitalizations as heart failure (using the codes described above), cardiovascular (ICD-9-CM codes between 390 to 459 with the exception of those for heart failure) and non-cardiovascular (all other codes). Hospitalizations were also described based on both individual and multilevel CCS categories. Finally, we identified the top ten CCS categories that were listed as the primary discharge diagnoses.

Outcome related measures were presented separately for both primary and secondary heart failure diagnoses and included in-hospital mortality, length of stay, and discharge disposition. Discharge disposition was categorized as routine, intermediate care transfers, and home health care.

Statistical Analysis

All statistical analyses were performed using the sampling weights and stratified sample design of the NIS to obtain nationally-representative estimates.

Descriptive statistics for hospitalizations were presented as means with standard deviations for continuous variables and frequencies for categorical variables. We used chi-squared and one-way analysis of variance to evaluate differences in categorical and continuous variables across years. Chi-squared and Student t-tests were used to test differences in outcome characteristics between hospitalizations that did and did not have heart failure listed as the primary discharge diagnosis.

Yearly rates of primary and secondary heart failure hospitalizations were calculated by dividing the number of hospitalizations by the United States population over the age of 18 in a given year. Population estimates for this study were obtained from the United States Census Bureau. Age and gender adjusted rates of hospitalization were determined using direct standardization method, adjusted to the 2009 population. Changes in hospitalization rates between 2001 and 2009 were determined with Poisson regression in which the independent variable was the calendar year.

We performed subgroup analyses of hospitalization rates for age and gender categories; we did not calculate rates by race categories due to the large number of missing values reported for this variable in NIS (24.6%). Rates for subgroups were determined by taking the number of hospitalizations and dividing by the adult US population for the given category. We also calculated the age adjusted rates of hospitalization for gender using the population distribution of age in 2009 irrespective of gender. We tested significance in trends with Poisson regression of number of hospitalizations per year, offset by the target population in the given year.

Statistical analyses were performed using Stata 11 (StataCorp, College Station, TX).

Results

From 2001 to 2009, there were an estimated 37,563,876 hospitalizations with a primary or secondary diagnosis of heart failure in the United States. Hospitalizations increased from 3,891,737 in 2001 to 4,244,865 in 2009, although the number of hospitalizations peaked in 2006 (Table 1).

The mean age of patients hospitalized with a diagnosis of heart failure decreased over the period from 74.2 to 73.1 years; this decrease was primarily attributable to an increase in the proportion of hospitalizations among individuals 18–64 years, coupled with a decrease among individuals 65–84 years (Table 1). The majority of hospitalized patients were female

and white, although the proportion of each decreased over the period (55.9 to 52.7% and 77.4 to 72.5%, respectively). Medicare was the most common payer for hospitalizations.

The mean number of Elixhauser comorbidities increased from 5.58 in 2001 to 5.91 in 2009 (Table 1). Cardiovascular comorbidities, including coronary atherosclerosis, cardiac arrhythmias, and hypertension, were common and increased over the period. Additionally, the prevalence of a number of related non-cardiovascular comorbid conditions dramatically increased between 2001 and 2009; for instance, the prevalence of diabetes rose from 35.5% to 41.1%, renal disease from 10.6% to 40.1%, and mental illness from 25.5% to 38.3%.

Among the total number of heart failure hospitalizations between 2001 and 2009, 26.9% carried a primary diagnosis of heart failure while the remaining 73.1% were secondary heart failure hospitalizations. The total number of primary heart failure hospitalizations declined from an estimated 1,137,944 hospitalizations in 2001 to 1,086,685 hospitalizations in 2009, representing an annual decrease of 1.0% (95% CI 0.9–1.0%) per year. Conversely, secondary heart failure hospitalizations increased from 2,753,793 to 3,158,179 over the period, with a yearly growth rate of 1.6% (95% CI 1.6-1.6%). The number of secondary heart failure hospitalizations peaked in 2006 at 3,252,693.

Age- and gender-standardized rates of primary heart failure hospitalization decreased during the study period, from 566 per 100,000 individuals in 2001 to 468 per 100,000 in 2009 (Figure 1). The annual rate of decline of primary heart failure hospitalization rate was 2.8% (95% CI 1.7–3.8%). Age- and gender-standardized rates of secondary heart failure hospitalizations increased annually between 2001 and 2006 and then decreased the following two years to return to levels that did not differ from those at the beginning of the decade. Overall, there was no significant change in the age- and gender-standardized rate of secondary heart failure hospitalizations over the period (annual rate of change −0.2%; 95% CI −0.9–0.4%).

Rates of primary heart failure hospitalization among individuals ages 18–49 increased overall between 2001 and 2009, although the rates peaked in 2004–2006 (Table 2). Among all other age categories, primary heart failure hospitalization rates declined. Secondary heart failure hospitalizations increased significantly over the study period for subgroups of age 18–49 and 50–64; however, among older individuals, rates increased initially but subsequently declined to rates below that of 2001. Both genders showed a similar pattern in trends as the overall cohort (Table 2). Although females had higher rates of hospitalizations as compared to males, this difference was due to the older age distribution of females as compared to males. With standardization to the 2009 population distribution for age among all genders, males had higher rates of both primary (586 vs 465 per 100,000 persons) and secondary (1,526 vs 1,324 per 100,000) heart failure hospitalizations during the period.

The percent of all hospitalizations that carried a primary diagnosis of heart failure decreased from 29.2% in 2001 to 25.6% in 2009. The rates of hospitalizations due to other cardiovascular causes also decreased, while hospitalizations for non-cardiovascular causes increased from 48.5% to 54.1% from 2001 to 2009. Over 16% of all hospitalizations carried a primary diagnosis related to pulmonary disease, 6% were related to digestive diseases, and nearly 6% were related to injuries and poisoning (Table 3). Significant increases in the percentage of hospitalizations for both renal and infectious diseases were observed (Table 3). Among all heart failure-related hospitalizations, pneumonia was the second most common primary diagnosis (after heart failure), although its prevalence significantly decreased during the period (Figure 2). Comparable declines in percentages of hospitalizations were observed for acute myocardial infarction and coronary atherosclerosis, while other common pulmonary diagnoses, such as COPD and respiratory failure increased.

Hospitalizations for both sepsis and acute renal failure were increasingly common over the period (Figure 2).

In-hospital mortality rates significantly decreased over the decade for both primary and secondary heart failure hospitalizations (Table 4), with mortality rates nearly double for secondary as compared to primary heart failure hospitalizations. Length of stay also decreased over the period for both primary and secondary heart failure hospitalizations. Rates of both home health care and transfer to intermediate care facilities increased over the decade, and both were more common among individuals with a secondary heart failure diagnosis (Table 4).

Discussion

In this nationally representative sample of hospitalizations in the United States, the total number heart failure related hospitalizations increased from 3,891,737 in 2001 to 4,244,865 in 2009. During this period, primary heart failure hospitalizations steadily decreased, while the total number of secondary heart failure hospitalizations increased by nearly 400,000. As a result, the percentage of hospitalizations attributable to causes other than heart failure increased and accounted for 75% of the total number of heart failure related hospitalizations in the United States by 2009.

Prior studies have suggested that both primary and secondary heart failure hospitalizations increased significantly between 1973 and 2004. (12,13,21,22) Conversely, in a recent study of Medicare beneficiaries, Chen and colleagues found a decrease in primary heart failure hospitalizations between 1998 and 2008. (14) This study was the first to suggest that heart failure hospitalization rates were decreasing in the United States, (23) a finding which our population sample confirmed. However, our study demonstrated that the number of secondary heart failure hospitalizations increased during the period. This suggests that the improvements observed during the last decade in primary heart failure hospitalization rates have not been realized for all-cause hospitalization.

Our observed increase in secondary heart failure hospitalizations can be partly explained by the high number of rehospitalizations among patients with heart failure. Rehospitalizations have not declined significantly in recent years, (24,25) and most frequently are caused by conditions other than heart failure, so this category of hospitalizations contributes primarily to secondary heart failure hospitalizations. (23) As a result, interventions to reduce rehospitalizations and secondary heart failure hospitalizations should include consideration for treatment of comorbid conditions. We did observe a trend of improvement in secondary heart failure hospitalizations after 2006 suggesting that recent interventions to reduce all-cause rehospitalizations may be finding some success. Such interventions include clinical interventions, including the increase in home health services observed in our study, and policy interventions, including public reporting of heart failure rehospitalizations by Medicare, which began during the period. (26)

Clinical and policy interventions may have also contributed to the observed decrease in in-hospital mortality observed in our study. This trend is consistent with earlier studies of primary heart failure hospitalization in the Medicare population. However, those studies demonstrated little to no improvement in post-discharge mortality and rehospitalizations. (24,27) The effect of recent interventions on post-discharge outcomes deserves further attention.

Trends by Age and Gender

Our study demonstrated that the reductions in primary heart failure hospitalizations among the Medicare population were not observed in all age groups. We found no change in the rate of primary heart failure hospitalizations among individuals below the age of 50 between 2001 and 2009. Furthermore, these younger adults had the highest growth in secondary heart failure hospitalizations during the time period. These findings suggest that initiatives to reduce hospitalizations and rehospitalizations among heart failure patients should increase efforts to target younger patients.

At the beginning of the study, females had higher rates of primary heart failure hospitalizations than males. These gender differences were consistent with prior studies. (22) However, by the end of the study period, males had a higher rate of primary heart failure hospitalizations. These results are consistent with previous studies that have suggested that the prevalence of heart failure in males is increasing in comparison to females. (28)

Relationship with Comorbid Conditions

Both cardiovascular and non-cardiovascular comorbid conditions were common in patients hospitalized with heart failure and increased over the period. While the high rates of diseases such as diabetes, kidney disease, infections, and COPD are not surprising as some of these conditions are risk factors for heart failure, (29,30) the presence of an increased number of comorbidities has been associated with worse outcomes in heart failure. (31–33) Furthermore, the presence of multiple chronic conditions can make patient management difficult due to issues such as greater medication burden, reduced adherence, treatment for one condition worsening the other, and physician uncertainty. (34,35) New models of clinical decision making and care delivery are needed to address the needs of the increasing number of individuals with heart failure and comorbid conditions. (35,36)

Comorbidities such as COPD and renal failure may present with symptoms that are similar to heart failure which lends uncertainty to the primary diagnosis of hospitalization. Given this dilemma, our findings that primary heart failure hospitalizations decreased while secondary heart failure hospitalizations increased may be related to changes in coding practices. Medicare began tracking quality measures for primary heart failure hospitalizations in the late 1990s and this information became publicly available in 2004. (37,38) As a result of such initiatives, hospital coders had incentive to become more prudent in assigning a primary heart failure diagnosis to hospitalizations with multiple acute medical issues, so as not to subject such hospitalizations to public review. A similar "downcoding" of pneumonia hospitalizations was suggested in a recent study using the NIS dataset. (39,40) In this context, our finding of a decrease in primary heart failure hospitalizations may be partly attributable to this shift in coding practices.

Several limitations deserve mention. First, diagnostic codes are subject to misclassification and, specifically, we were unable to determine whether a secondary diagnosis represented an active condition versus a remote history of heart failure. We addressed this issue by using an algorithm for ICD9 coding that was similar to well validated ones (41–44) and comparable to those used in prior studies. (13) Second, while the NIS collects data on 8 million hospitalizations annually, or approximately 20% of all hospitalizations in the United States, the dataset is a sample and may not fully reflect all hospitalizations. Third, observations in NIS are at the level of the hospitalization rather than the individual, so we were unable to determine trends in the number of patients hospitalized for heart failure. Nonetheless, the total number of heart failure related hospitalizations are frequently used to measure the burden of this chronic disease. (45,46) Fourth, increases in prevalence of comorbidities may

be due to ascertainment or detection bias. For instance, we observed a dramatic increase in the rate of comorbid kidney disease in our study, a finding which may have been influenced by increased detection of mild renal dysfunction as a result of the adoption of glomerular filtration rate (GFR) estimation with routine laboratory results. (47) Fifth, temporal changes in coding practice may have increased the prevalence of heart failure as a secondary diagnosis due to financial incentives related to "upcoding" of complicating conditions. (48) As a result, we were unable to verify the reason for observed trends in heart failure hospitalizations and believe this is an area for further research.

Conclusion

Despite trends showing a decrease in primary heart failure hospitalizations, this chronic disease still accounts for over one million primary hospitalizations each year. Additionally, patients with heart failure experience over three million secondary hospitalizations annually, often due to related comorbid conditions. In total, heart failure is associated with over four million hospitalizations per year in the United States and imparts a substantial burden on both patients and the health care system. Recent interventions do not appear to have decreased the significant number of heart failure related hospitalizations during the past decade. Future strategies to reduce hospitalizations of heart failure patients should consider both cardiac disease and non-cardiac comorbid conditions.

Acknowledgments

Abbreviations

COPD	chronic obstructive pulmonary disease
NIS	Nationwide Inpatient Sample

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Figure 1. Rates of heart failure related hospitalization
Annual age- and gender- adjusted rates of hospitalizations in the United States with a
diagnosis of heart failure in the primary versus secondary position are shown.
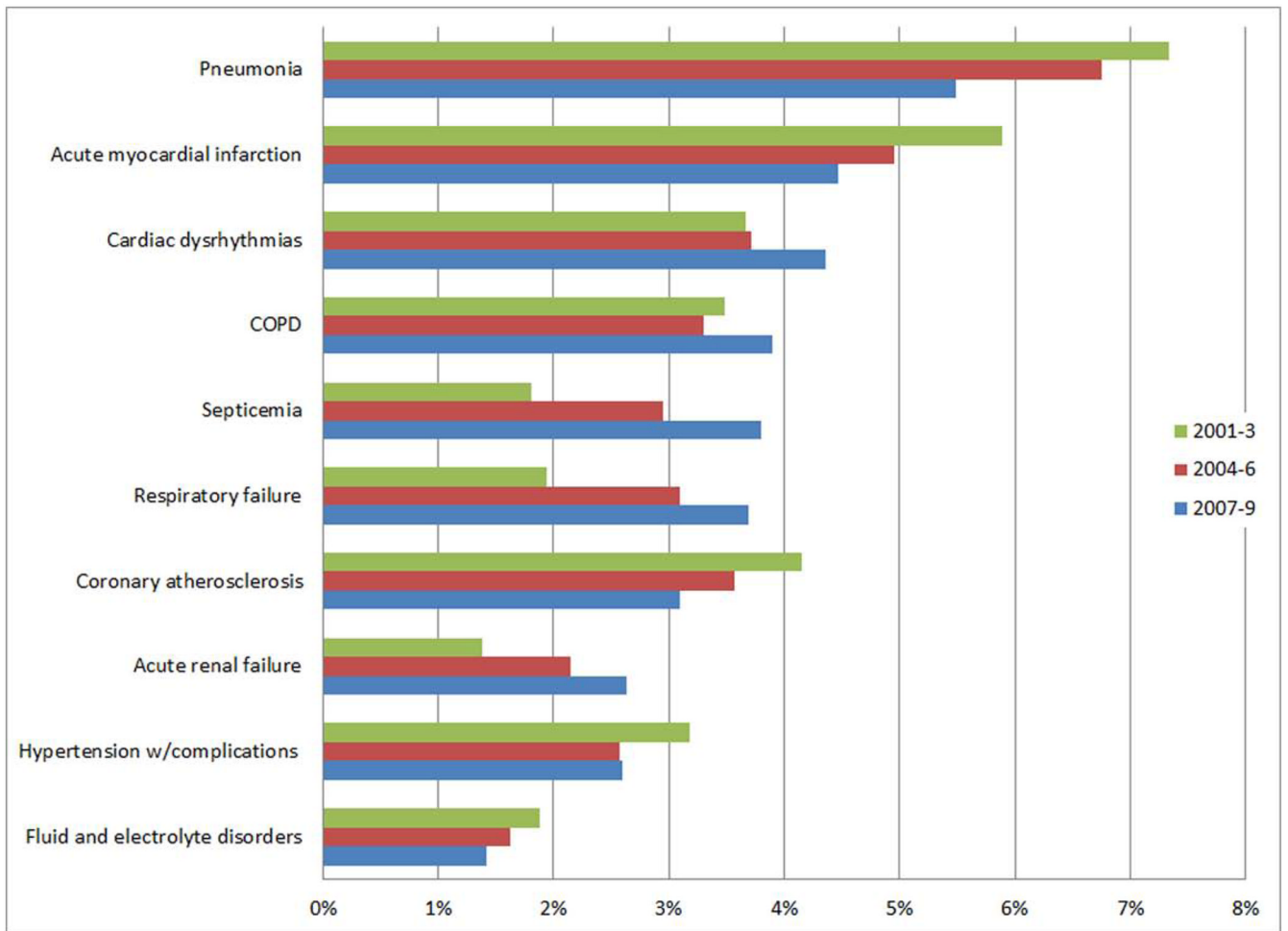
Figure 2. Trends in prevalence of the ten most common primary diagnoses for heart failure related hospitalizations, other than heart failure itself
Each bars represent the percent of all heart failure related hospitalizations which were related to a given diagnosis for a three year period. P<0.001 for each diagnosis across all years.

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Table 1

Characteristics of Hospitalizations with a Primary or Secondary Diagnosis of Heart Failure

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Heart Failure Hospitalizations (n)	3,891,737	3,979,482	4,146,308	4,230,905	4,302,805	4,388,414	4,209,367	4,169,995	4,244,865
Age									
Mean (sd)	74.2 (0.1)	74.0 (0.1)	73.7 (0.2)	73.6 (0.2)	73.9 (0.2)	73.4 (0.2)	73.3 (0.2)	73.6 (0.2)	73.1 (0.2)
18–49	5.3	5.5	5.9	6.1	5.9	6.4	6.4	6.0	6.4
50–64	15.5	16.2	17.0	17.4	17.1	18.1	18.6	18.3	19.2
65–74	22.6	22.3	22.1	21.8	21.2	21.2	21.3	21.2	21.6
75–84	34.0	33.7	33.1	32.8	32.6	31.6	30.8	30.6	29.6
85 and older	22.6	22.3	22.0	21.9	23.2	22.7	22.9	23.9	23.2
Female	55.9	55.7	55.5	54.8	54.5	53.9	53.7	53.4	52.7
Race									
White	77.4	75.2	73.1	73.8	77.2	73.2	72.3	74.0	72.5
Black	13.1	14.6	14.9	15.6	12.1	15.1	16.1	14.7	15.5
Other	9.5	10.2	12.0	10.6	10.7	11.7	11.6	11.4	12.0
Rural Region	20.0	18.8	19.0	16.8	16.6	16.0	15.9	15.9	15.1
Region									
Northeast	20.3	20.9	21.0	19.4	19.6	19.9	19.5	19.0	19.8
Midwest	25.0	25.2	25.5	26.1	24.5	25.0	26.0	24.8	25.4
South	39.9	38.5	38.4	39.9	40.2	40.1	39.0	40.2	39.1
West	14.8	15.4	15.1	14.7	15.6	15.1	15.5	16.1	15.7
Primary Payer									
Medicare	78.2	78.8	79.2	78.1	79.5	78.4	77.0	76.4	76.3
Medicaid	5.7	5.7	6.2	6.3	6.1	6.5	6.4	6.4	7.1
Private									
Insurance	13.1	12.5	11.6	12.0	11.0	11.4	12.4	13.1	12.4
Other	3.1	3.1	3.0	3.6	3.5	3.8	4.1	4.1	4.3
Number of Comorbidities, mean (SD)	5.58 (0.01)	5.69 (0.02)	5.76 (0.01)	5.83 (0.02)	5.88 (0.02)	5.92 (0.02)	5.88 (0.02)	5.85 (0.02)	5.91 (0.02)
Primary Heart Failure Diagnosis	29.2	28.4	28.4	27.4	26.3	25.9	25.4	25.6	25.6
Comorbidities									
Diabetes	35.5	36.5	36.8	36.9	36.7	37.7	39.7	40.1	41.1

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Fluid and electrolyte disorders	23.6	24.9	25.5	26.9	28.5	29.0	30.1	29.4	30.4
Heart valve disorders	16.0	16.4	16.8	16.7	17.4	18.0	17.9	16.5	17.4
Acute myocardial infarction	9.2	9.2	8.9	8.4	8.2	7.9	7.9	8.0	7.9
Coronary atherosclerosis	46.8	46.9	46.7	46.6	46.1	46.9	47.8	49.7	49.8
Cardiac dysrhythmias	36.5	37.6	37.8	38.9	39.7	40.3	40.9	40.8	41.7
Peripheral atherosclerosis	6.8	7.2	7.0	7.2	7.1	7.5	8.1	8.6	8.7
Pneumonia	14.3	15.0	15.5	15.6	16.9	16.3	16.9	17.2	17.0
COPD	29.5	30.5	30.3	30.6	31.6	31.6	31.9	30.1	30.3
Renal failure	10.6	11.8	13.0	14.3	18.7	27.4	36.0	36.9	40.1
Delirium and Dementia	8.4	8.9	8.9	9.1	9.2	9.5	10.0	11.2	10.9
Anemia	21.5	22.4	22.9	23.8	23.9	24.5	26.7	28.8	30.1
Mental illness	25.5	27.9	28.5	29.6	30.7	32.7	34.7	37.9	38.3
Hypertension	53.2	56.2	57.9	59.9	60.9	64.1	65.2	68.2	69.9
Cerebrovascular disease	8.2	8.1	7.7	7.6	7.4	7.5	7.7	8.4	8.3
Liver disease	3.2	3.5	3.6	3.8	4.0	4.2	4.1	4.6	5.1

Values are in percentage points unless otherwise specified. P-values for trends across years were $p<0.0001$, with the exception of race ($p<0.01$), rural region ($p<0.05$) and region ($p=0.9$)

Table 2

Trends in Primary and Secondary Heart Failure Hospitalizations by Age and Gender Category

	Primary			Secondary		
	2001–2003	2004–2006	2007–2009	2001–2003	2004–2006	2007–2009
Age						
18–49	59	65	61	108	131	134
50–64	456	431	384	983	1071	1045
65–74	1415	1293	1095	3462	3641	3376
75–84	2899	2681	2373	7601	7906	7303
85 and older	5235	5002	4521	14784	14991	13499
Gender						
Female	565	520	462	1448	1532	1438
Male	503	509	472	1205	1312	1285

Estimates per 100,000 population; P-trends < 0.0001 for all categories

Table 3

Primary Diagnosis Category for Hospitalizations with a Primary or Secondary Diagnosis of Heart Failure

	2001–2003	2004–2006	2007–2009
Cardiovascular diseases	49.9	46.3	45.3
Coronary atherosclerosis	4.2	3.6	3.1
Acute myocardial infarction	5.9	5.0	4.5
Cardiac dysrhythmias	3.7	3.7	4.4
Heart valve disorders	0.8	0.7	0.8
Cerebrovascular disease	2.5	2.4	2.3
Hypertension	3.3	2.7	2.8
Peripheral atherosclerosis	0.6	0.6	0.6
Respiratory diseases	16.0	16.5	16.6
COPD	3.5	3.3	3.9
Pneumonia	7.3	6.8	5.5
Diabetes	1.6	1.6	1.5
Fluid and electrolyte disorders	1.9	1.6	1.4
Genitourinary diseases	3.4	4.3	4.9
Renal Failure	1.5	2.3	2.8
Urinary tract infections	1.3	1.5	1.6
Diseases of the blood	1.0	1.1	1.1
Anemia	0.8	0.9	1.0
Diseases of the digestive system	6.2	6.4	6.1
Liver disease	0.4	0.4	0.3
Mental illness	1.2	1.2	1.2
Delirium and dementia	0.4	0.4	0.3
Infectious diseases	3.2	4.5	5.5
Skin infections	1.1	1.2	1.3
Neoplasms	2.3	2.3	2.0
Injury and poisoning	5.4	5.9	6.1
Fractures	2.0	2.1	2.1
Diseases of the musculoskeletal system	1.7	1.8	1.9
Symptoms; signs; and conditions	1.4	1.4	1.3
All others	4.9	5.2	5.3

Table 4

Outcomes of Heart Failure Hospitalizations, by Primary vs. Secondary Diagnosis of Heart Failure

	2001 – 2003			2004 – 2006			2007 – 2009		
	Primary	**Secondary**		**Primary**	**Secondary**		**Primary**	**Secondary**	
Sample size, number	3,446,627	8,560,084		3,425,655	9,496,468		3,217,925	9,406,341	
Mortality, %	4.3	8.1	P < 0.001	3.7	7.3	P < 0.001	3.2	6.2	P < 0.001
Length of stay, mean (SD)	5.56 (0.04)	7.48 (0.05)	P < 0.001	5.37 (0.03)	7.35 (0.04)	P < 0.001	5.27 (0.04)	6.82 (0.05)	P < 0.001
Discharge disposition, %			P < 0.001			P < 0.001			P < 0.001
Routine	61.3	46.4		56.8	42.3		54.9	42.7	
Hospital Transfers	3.6	4.1		3.5	3.8		3.1	3.6	
SNF and Intermediate Care Transfers	16.7	28.0		18.3	29.9		19.2	29.7	
Home health care	13.3	12.9		16.6	16.0		18.4	17.1	