Incidence of heart failure and mortality after acute coronary syndromes

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Background The long-term incidence of heart failure (HF) in ST-elevation myocardial infarction (STEMI), non–ST-elevation myocardial infarction (NSTEMI), or unstable angina (UA) patients is uncertain. We examined the 1-year incidence of HF and its association with mortality among patients surviving their first acute coronary syndrome (ACS) hospitalization.

Methods and results A retrospective cohort study of patients, aged ≥20 years, with no prior HF, hospitalized for the first time with ACS between April 1, 2002, and December 31, 2008, in Alberta, Canada, and followed up for 1 year. *Index HF* was defined as HF that developed as a complication during the index ACS hospitalization, and *post-discharge HF*, as HF developing after discharge from the index ACS hospitalization.

Among 9,406 STEMI, 11,008 NSTEMI, and 4,910 UA patients, 13.6%, 14.8%, and 5.2% had index HF, respectively ($P <$ .01). At 1-year, cumulative HF rates were 23.4% in STEMI, 25.4% in NSTEMI, and 16% in UA patients. Among hospital survivors, 1-year mortality rate was 13.9% in patients with index HF, 10.6% in patients with postdischarge HF, and 2.4% in patients with no HF. In multivariable analysis, both index HF (adjusted hazard ratio 3.2, 95% CI 2.7-3.7) and postdischarge HF (adjusted hazard ratio 4.6, 95% CI 3.9-5.4) were associated with 1-year mortality.

Conclusions There are significant differences in the incidence of HF among STEMI, NSTEMI, and UA patients. The increased mortality risk associated with index HF and postdischarge HF suggests a need for vigilant follow-up of all ACS patients for prompt detection and treatment of HF. (Am Heart J 2013;0:1-7.e2.)

It has been previously demonstrated that heart failure (HF) commonly develops after acute myocardial infarction (AMI) and is associated with poor prognosis.[1-7] Although improvements in therapy for AMI over the past decade have led to reductions in mortality in the short term, they have been accompanied with increased morbidity, including HF post-AMI.[8,9] The prognostic importance of HF during the hospitalization among patients with non–ST-elevation acute coronary syndromes has also been established.[10-12] In addition to its occurrence, the timing of HF during the index acute coronary syndromes (ACS) hospitalization appears to modulate outcomes, with patients who develop HF after presentation having worse outcomes compared with patients presenting with HF at baseline.[10-12] However, the prognostic impact of HF that develops after discharge from hospital is uncertain, and it is unclear if it differs across the 3 major types of ACS (ST-elevation myocardial infarction [STEMI], non–ST-elevation myocardial infarction [NSTEMI], and unstable angina [UA]). The few studies that have examined long-term incidence of HF have been restricted to patients with AMI, with no distinction made between STEMI and NSTEMI patients.[9,13,14] Indeed, the long-term incidence of HF developing after discharge from hospital in patients with NSTEMI and UA and its prognostic import have not been previously described.

To address these gaps in the evidence, we examined the 1-year incidence of HF among patients hospitalized for the first time with STEMI, NSTEMI, or UA in a large population-level cohort with universal health care access. We examined the association of new HF developing during the ACS hospitalization and HF occurring after discharge, with 1-year mortality among patients who were discharged alive from the index ACS hospitalization.

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Methods

Study population

Our study cohort consists of all residents of Alberta aged 20 years or older hospitalized at an acute care facility with a primary diagnosis of ACS between April 1, 2002, and December 31, 2008 (subsequently referred to as the index hospitalization). For transfer patients, the index hospitalization refers to the index episode and includes concurrent hospitalizations occurring with 24 hours of each other. The diagnosis of ACS is based on *International Statistical Classification of Diseases, 10th Revision* (*ICD-10*), codes, which allow for patients to be categorized as STEMI, NSTEMI, or UA (see e-Appendix Table 1 for codes). Patients with a prior admission for ACS or HF in the last 5 years were excluded. Patients were followed up for 1 year or death, whichever occurred first.

Data sources

Data for the study consist of databases described previously and maintained by the Alberta Ministry of Health and Wellness.[9,15,16] For the current study, the following data sources were linked using an anonymized but unique patient identifier: (1) the Discharge Abstract Database, which contains diagnostic and treatment information, length of stay, and discharge status for patients admitted to any 103 acute care hospitals in Alberta; (2) the Ambulatory Care Classification System database, which records all outpatient clinic visits (including emergency department [ED] visits) in Alberta; (3) the Physician Claims Database, which includes all physician claims for outpatient services; and (4) the Alberta Health Care Insurance Registry database, which tracks the vital status of all residents of Alberta. As Alberta has a government-funded single-payer health care system with universal access, these databases capture all patient interactions with the health care system.

Definition of outcomes and covariates

Using a previously published categorization based on the time of its first occurrence, we defined index HF as HF developing as a complication during the index ACS hospitalization and postdischarge HF as a hospitalization or outpatient visit for HF after discharge from the index ACS hospitalization.[9] Both categories are mutually exclusive, that is, only patients without index HF were eligible to develop postdischarge HF. In a chart audit, the *ICD-10* code (I50.x) to identify HF has been previously shown to have a positive predicted value of 90.2% and a negative predicted value of 97.2%.[17]

Previously established *International Classification of Diseases, Ninth Revision* (*ICD-9*)–, and *ICD-10* code–based definitions (see e-Appendix Table 1 for codes) were used to identify other comorbidities including diabetes, hypertension, cerebrovascular disease, cancer, renal disease, peripheral vascular disease, chronic obstructive pulmonary disease (COPD), and atrial fibrillation.[17,18] Comorbidities were considered to be present at baseline if they were coded in the index hospitalization record or in any inpatient record in the preceding 5 years. Hospitalization records were examined to identify patients who underwent cardiac catheterization, percutaneous coronary intervention (PCI), or coronary artery bypass graft (CABG) surgery during the index ACS hospitalization.

Statistical analysis

Baseline characteristics of patients with STEMI, NSTEMI, and UA were examined. Continuous variables are presented as medians with interquartile range (IQR) and are compared across ACS subtypes using Kruskal-Wallis tests, and categorical variables are presented as frequencies and are compared using χ^2 tests. Similar tests were used to compare baseline characteristics, treatments, and outcomes among patients with and without index HF within each ACS subtype.

Kaplan-Meier method was used to estimate cumulative 1-year incidence of HF among STEMI, NSTEMI, and UA patients. Patients who died within the first year without developing HF were censored at the time of death. The log-rank statistic was used to examine whether the cumulative incidence of HF differed across ACS subtypes. A Cox regression model was developed to examine the association of index HF and postdischarge HF with 1-year mortality among patients discharge alive from the index ACS hospitalization. In this model, index HF was included as dichotomous variable, and postdischarge HF was included as a time-dependent covariate. Other variables included in the model were age, sex, ACS type, diabetes, hypertension, cerebrovascular disease, cancer, renal disease, peripheral vascular disease, COPD, atrial fibrillation, and revascularization (PCI or CABG) status during the index ACS hospitalization.

All analyses were conducted in SAS version 9.3 (SAS Institute, Inc, Cary, NC). The health ethics board of the University of Alberta approved this study.

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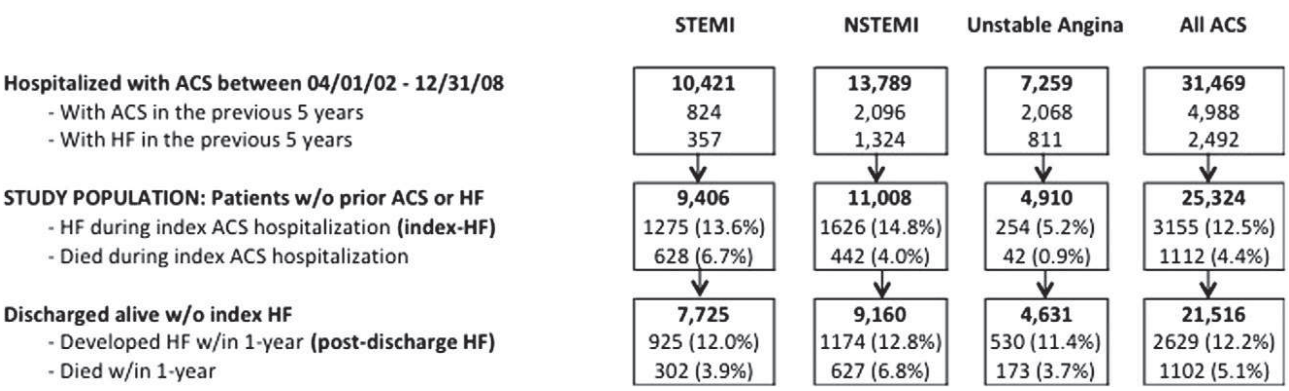
The authors are solely responsible for the design and conduct of this study, all study analyses, the drafting and editing of the manuscript, and its final contents. Although this study is based in part on data provided by Alberta Health and Wellness, the interpretation and conclusions contained herein are those of the researchers and do not necessarily represent the views of the Government of Alberta.

Results

A total of 31,469 patients had an acute care hospitalization for ACS between April 1, 2002, and December 31, 2008 (Figure 1). Patients with prior ACS (n = 4,988, 15.9%) or with prior HF (n = 2,492, 7.9%) were excluded from the cohort. The final study population consisted of 9,406 (37.1%) STEMI, 11,008 (43.5%) NSTEMI, and 4,910 (19.4%) UA patients. ST-elevation myocardial infarction patients were younger, less likely to be female, and generally had lower rates of comorbid disease relative to NSTEMI and UA patients (Table I).

Figure 1



Patient flow diagram. Detailed description of the number of patients, overall, and in each ACS subtype, with events of interest. Abbreviations: w/in, within; w/o, without.

Table I. Baseline characteristics of 25323 patients with no prior HF hospitalized for the first time with ACS

Characteristic	STEMI	NSTEMI	UA	*P*
n	9406	11008	4910	
Age, y (median [IQR])	62 (52, 73)	67 (56, 78)	66 (56, 75)	<.01
Females, %	27.1	34.2	37.1	<.01
Diabetes, %	20.6	25.8	23.1	<.01
Hypertension, %	52	64.7	62.9	<.01
COPD, %	10.2	14.2	12	<.01
CVD, %	4.2	6.7	5	<.01
Cancer, %	3.7	4.7	4	<.01
Renal disease	4.5	8.8	5.2	<.01
PVD, %	4.5	7.1	5.9	<.01
Atrial fibrillation, %	9.3	13.7	10.1	<.01

Abbreviations: *CVD*, Cerebrovascular disease; *PVD*, peripheral vascular disease.

Index hospitalization

During the index hospitalization, 1,275 (13.6%) STEMI, 1,626 (14.8%) NSTEMI, and 254 (5.2%) UA patients were diagnosed with HF (Figure 1). Across all ACS subtypes, index HF patients were older, more likely to be female, had significantly higher comorbidity rates, and longer lengths of stay compared with patients with no HF (Table II). During the period of the study, index HF rates decreased from 15.5% in 2002 to 2003 to 10.6% in 2008 ($P < .01$). Among patients with STEMI and NSTEMI, index HF patients were less likely to undergo cardiac catheterization, although this was not the case among UA patients. Across all 3 ACS subtypes, index HF patients were less likely to undergo PCI and more likely to undergo CABG during the index hospitalization compared with patients with no HF (Table II).

Overall, 1,112 (4.4%) patients died during the index ACS hospitalization (Figure 1). In-hospital mortality differed significantly ($P < .01$) across ACS subtypes and was highest in STEMI patients (6.7%), followed by NSTEMI patients (4.0%), and lowest in UA patients (0.9%). In-hospital mortality among all ACS patients with index HF was 14.5% and 3% among those without index HF. The higher risk of in-hospital mortality among patients with index HF relative to those without HF was observed across all 3 ACS subtypes (Table II).

Postdischarge follow-up

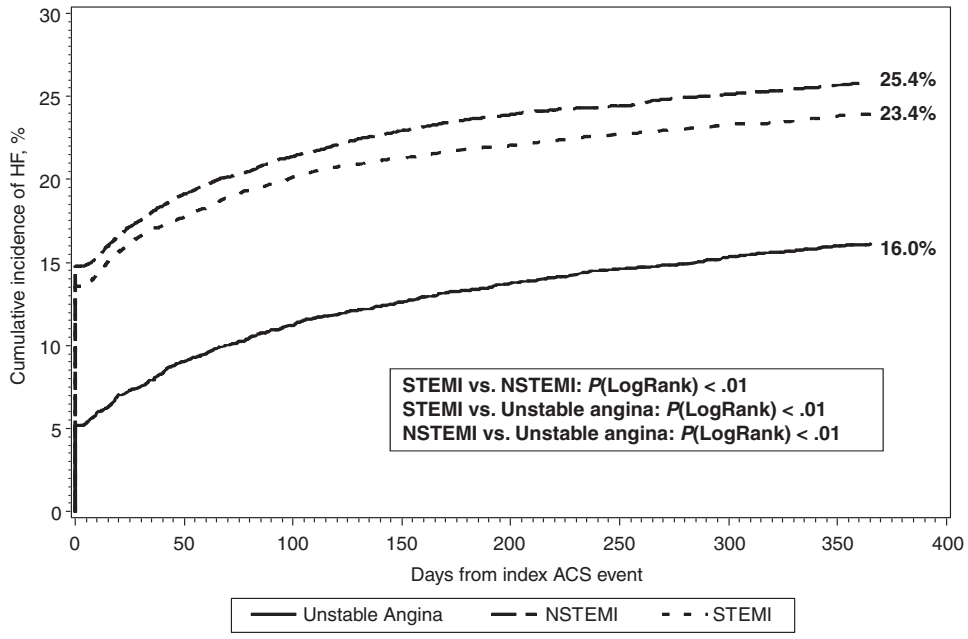
One-year cumulative rates of HF (index HF and postdischarge HF) were 23.4% in STEMI, 25.4% in NSTEMI, and 16% in UA patients ($P < .01$, Figure 2). In addition to the 3,155 patients with index HF, an additional 2,629 (12.2%) of the 21,516 patients who survived the index ACS hospitalization without HF developed postdischarge HF. Baseline characteristics of patients who developed postdischarge HF and the results of multivariable analyses to examine factors associated with the development of postdischarge HF are presented in e-Appendix Tables II and III. Approximately half of the patients with postdischarge HF (377 STEMI, 569NSTEMI, and 269UA)

Table II. Baseline characteristics, treatments, and hospital outcomes of patients who did and did not develop HF during the index ACS hospitalization

	STEMI (n = 9406)			NSTEMI (n = 11008)			UA (n = 4910)		
Characteristic	**No index HF**	**Index HF**	***P***	**No index HF**	**Index HF**	***P***	**No index HF**	**Index HF**	***P***
n	8131	1275		9382	1626		4656	254	
Age, y (median [IQR])	60 (52, 72)	72 (61, 80)	<.01	65 (55, 76)	77 (69, 84)	<.01	65 (56, 75)	75 (68, 83)	<.01
Female, %	25.8	35.5	<.01	32.5	44.6	<.01	36.8	40.9	.19
Diabetes, %	18.7	32.6	<.01	22.9	42.6	<.01	22.2	38.2	<.01
Hypertension, %	50.5	61.5	<.01	62.9	75.2	<.01	62.4	72.8	<.01
COPD, %	9.1	17.7	<.01	11.8	27.6	<.01	11.2	28	<.01
CVD, %	3.6	7.9	<.01	5.7	12.4	<.01	4.8	9.1	<.01
Cancer, %	3.4	5.4	<.01	4.3	6.8	<.01	4	5.1	.36
Renal disease, %	3	13.9	<.01	6.3	23.6	<.01	4.5	18.5	<.01
PVD, %	3.9	8.3	<.01	5.8	15.1	<.01	5.3	15.4	<.01
Atrial fibrillation, %	6.7	26.4	<.01	10.5	31.9	<.01	9.1	28.4	<.01
Index ACS hospitalization									
LOS, d, median (IQR)	6 (5, 9)	11 (8, 20)	<.01	7 (5, 10)	13 (8, 24)	<.01	5 (4, 9)	10 (6, 18)	<.01
Cardiac catheterization, %	68.9	63.8	<.01	53.9	43.2	<.01	30.6	31.5	.77
PCI, %	59.4	46.7	<.01	36.4	16.5	<.01	22.5	14.6	<.01
CABG, %	4.9	11.9	<.01	9.9	17.4	<.01	9.5	15.8	<.01
PCI or CABG, %	63.7	56.3	<.01	46.1	33.8	<.01	31.8	30.3	.62
In-hospital death	5	17.4	<.01	2.4	13.5	<.01	0.5	6.7	<.01

Abbreviations: *LOS, d*, Length of stay in days for the index episode, including transfers.

Figure 2

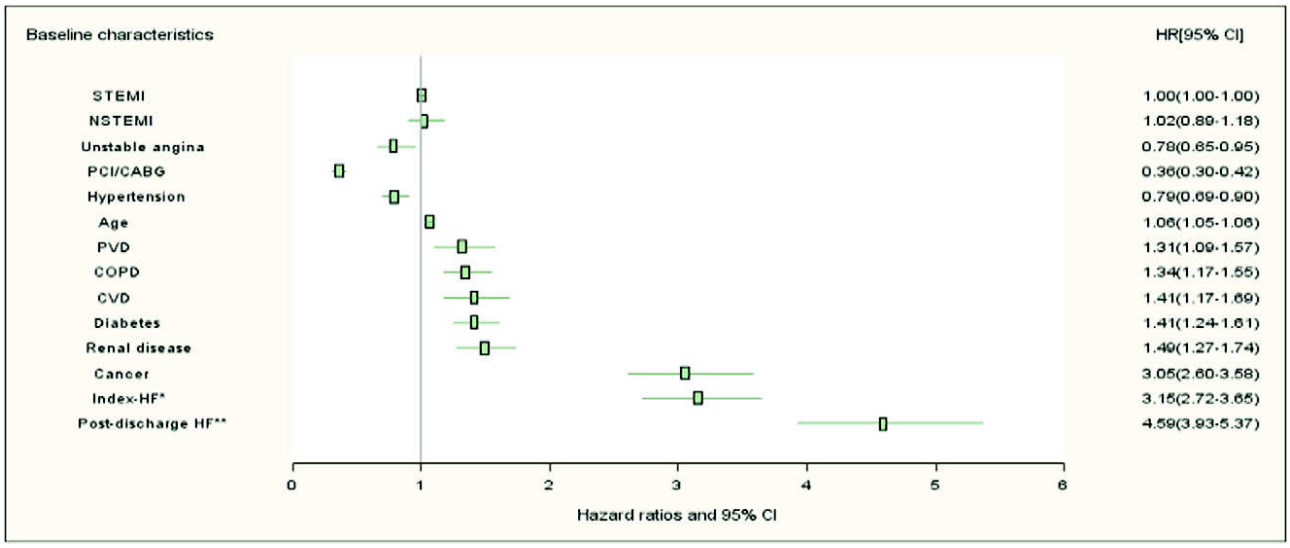


Heart failure incidence. Cumulative 1-year HF rates among STEMI, NSTEMI, and UA. *Note: Patients who died within 1 year and did not develop HF within 1 year were censored at the time of their death.

developed HF during a hospitalization or ED visit, whereas the other half had HF diagnosed during an outpatient clinic visit. Overall, 248 (9.4%) of the 2,629 patients who had postdischarge HF had an ACS rehospitalization before or at the time of HF diagnosis. Data on rehospitalization by HF status are presented in e-Appendix Table II.

Cumulative 1-year mortality rate was 8.7% (9.9% in STEMI, 9.7% in NSTEMI, and 4.4% in UA patients ($P < .01$).

Figure 3



Multivariable analysis. Adjusted association of index HF and postdischarge HF with 1-year mortality among 24,212 patients discharged alive from their first ACS hospitalization. *Index HF: Heart failure developing during the index ACS hospitalization. **Postdischarge HF: Heart failure occurring postdischarge from the index ACS hospitalization, included as a time-dependent variable. PVD, peripheral vascular disease; CVD, cerebrovascular disease; HR (95% CI), hazard ratio, 95% CI.

Of 24,212 patients who survived the index ACS hospitalization, an additional 1,102 patients (3.4% STEMI, 5.9% NSTEMI, and 3.6% UA) died by 1 year (Figure 1). Overall, unadjusted 1-year mortality rate, conditional on hospital survival, was higher among patients with index HF (13.9%) than among patients with postdischarge HF (10.6%) and no HF (2.4%).

After multivariable adjustment, both index HF and postdischarge HF were significantly associated with 1-year postdischarge mortality (Figure 3). Index HF was associated with an adjusted hazard ratio (aHR) of 3.2 (95% CI 2.7-3.7), whereas postdischarge HF, included as a time-dependent variable, was associated with an aHR of 4.6 (95% CI 3.9-5.4). Restricting the definition of postdischarge HF to that occurring during a subsequent hospitalization or ED visit increased the associated aHR to 7.6 (95% CI 6.5-9.0). In addition to index HF and postdischarge HF, other risk factors associated with a higher likelihood of 1-year mortality among hospital survivors were cancer, renal disease, cerebrovascular disease, diabetes, COPD, peripheral vascular disease, and increasing age. Hypertension and revascularization (PCI or CABG) during the index ACS hospitalization were associated with a lower 1-year mortality hazard. After adjusting for demographic, clinical, and treatment differences, there was no difference in 1-year mortality, conditional on hospital survival, between STEMI and NSTEMI patients (aHR NSTEMI vs STEMI 1.0, 95% CI 0.9-1.2). However, UA patients had a 20% lower mortality hazard relative to STEMI patients (aHR UA vs STEMI 0.8, 95% CI 0.7-1.0).

Discussion

In this population-level analysis of 25,324 patients hospitalized for the first time with ACS between 2002 and 2008, there were significant differences in HF developing both during (index HF) and after discharge from the index ACS hospitalization (postdischarge HF) across the 3 ACS subtypes (STEMI, NSTEMI, and UA). Among patients who survived the index ACS hospitalization, both index HF and postdischarge HF were associated with a higher 1-year mortality risk, although the magnitude of the association was higher for postdischarge HF.

Index HF rates differed significantly between STEMI (13.6%), NSTEMI (14.8%), and UA patients (5.2%). By 1 year, HF incidence had increased substantially in all 3 ACS subtypes: 23.4% in STEMI, 25.4% in NSTEMI, and 16% in UA patients. To our knowledge, no previous study has documented 1-year rates of HF and their association with mortality among the 3 ACS subtypes. In a previous study, we examined the long-term incidence of HF and its association with mortality in a cohort of 11,479 elderly patients hospitalized with myocardial infarction between 1994 and 2000.[9] By 5 years, 71% of the patients had developed HF, and new onset HF significantly increased mortality risk in these

patients. That study predated the advent of *ICD-10* coding system, and hence, we were unable to differentiate between STEMI and NSTEMI myocardial infarctions. Our current study, with novel contemporaneous data, substantially extends our previous work through the inclusion of a broader age spectrum of patients (patients aged 20 years or older) and by examining the relationship between HF and mortality across the three clinically relevant ACS subtypes.

Our finding of increased mortality risk associated with the development of HF in ACS patients is consistent with previous reports. In an analysis of 16,166 patients from the Global Registry of Acute Coronary Events registry, Steg et al[10] found HF to be associated with reduced hospital and 6-month survival across all ACS subtypes. Similar results were reported in non–ST-elevation acute coronary syndrome patients enrolled in the Can Rapid Risk Stratification of Unstable Angina Patients Suppress ADverse Outcomes with Early Implementation of the ACC/AHA Guidelines registry.[11] However, these and other studies examining the prognostic importance of HF in ACS were only able to assess the presence of HF during the hospital stay. Our study extends this examination to the postdischarge period and provides novel insights into the association of HF developing during the index ACS hospitalization and postdischarge HF with long-term mortality among survivors of the index ACS hospitalization.

Our study has strengths and limitations. Although it is population based and includes all patients hospitalized with ACS in a defined geographic area with universal health care access and 100% data capture, the data are administrative in nature and *ICD-9/ICD-10* codes were used to identify the patient population and their clinical characteristics. A previous study has shown that examining hospital records in the year before the index event provides a more complete assessment of comorbid conditions.[19] In our study, we examined hospital records in the 5 years before the index ACS hospitalization to identify comorbid conditions and prior ACS and HF. However, patients diagnosed with ACS or HF in an outpatient setting during the previous 5 years may have been included in our patient population. Although we were able to differentiate between STEMI, NSTEMI, and UA patients, we did not have any data on coronary anatomy or on size and location of infarct. Similarly, we did not have information on the type (systolic/diastolic) or severity of HF. We also did not have data on details of therapy for either ACS or HF.

Conclusion

In a population-level cohort of patients hospitalized for the first time with an ACS event, there were significant differences in the long-term incidence of HF among STEMI, NSTEMI, and UA patients. Among hospital survivors, HF developed either during the ACS hospitalization or after discharge confers a substantial risk of death during the first year. The downstream morbidity and mortality associated with HF suggest a need for increased surveillance and timely diagnosis and treatment among all ACS patients.

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Appendix A

Table I. List of *ICD-9* and *ICD-10* codes

Characteristic	*ICD-9*	*ICD-10*	CCI
AMI			
STEMI	410.x	I21.0, I21.1, I21.2, I21.3	
NSTEMI	410.x	I21.40, I21.41, I21.42, I21.49	
Unstable angina	411.1	I20.0	
Baseline characteristics			
Diabetes	250.x	E10.x - E14.x	
Hypertension	401.x - 405.x	I10.x, I15.x, I11.x - I13.x	
CHF	428.x	I50.x	
CVD	362.34, 430.x - 438.x	G45.x - G46.x, H34.0, I60.x - I70.x	
Cancer	140.x - 172.x, 174.x - 195.x, 200.x - 202.x, 196.x - 199.x, 203.0, 238.6	C00.x - C26.x, C30.x - C34.x, C37.x - C41.x, C77.x - C80.x, C45.x - C58.x, C60.x - C76.x, C43.x, C97.x	
Renal disease	403.01, 403.11, 403.91, 404.02, 404.03, 404.12, 404.13, 404.92, 404.93, 583.0 - 583.7, V451, 588.0	Z49.0 - Z49.2, N032.x - N037.x, N052.x - N057.x, I120.x, I131.x, Z94.0, Z99.2, N25.0, N18.x, N19.x	
PVD	093.0, 437.3, 447.1, 557.1, 557.9, V434, 443. - 443.9, 440.x, 441.x	I70.x, I71.x, I73.1, I73.8, I73.9, U77.1, I79.0, I79.2, K55.1, K55.8, K55.9, Z95.8, Z95.9	
Atrial fibrillation	427.3	I48.x	
Procedures			
PCI			1.IJ.50
CABG			1.IJ.76
Catheterization			3.IP.10, 1.IJ.26

Table II. Baseline characteristics and outcomes by HF status (no HF, index HF, and postdischarge HF)

	STEMI (n = 9406)			NSTEMI (n = 11008)			UA (n = 4910)		
Characteristic	**No HF**	**Index HF**	**Postdischarge HF**	**No HF**	**Index HF**	**Postdischarge HF**	**No HF**	**Index HF**	**Postdischarge HF**
n	7206	1275	925	8208	1626	1174	4126	254	530
Age, y*	59 (51,71)	72 (61,80)	69 (56,78)	64(54,75)	77 (69,84)	75 (64,82)	64 (55,73)	75 (68,83)	74 (66,81)
Female, %	24.8	35.5	33.4	31.7	44.6	37.7	36.4	40.9	40†
Diabetes, %	18	32.6	24.5	21.6	42.6	32.1	21.1	38.2	30.9
Hypertension, %	49.3	61.5	59.2	61.6	75.2	71.6	61.4	72.8	69.6
COPD, %	8.4	17.7	14.5	10.7	27.6	20	10.3	28	18.3
CVD, %	3.4	7.9	5.1	5.4	12.4	7.7	4.7	9.1	5.7
Cancer, %	3.1	5.4	5.5	4	6.8	6.3	3.6	5.1	6.4
Renal disease, %	2.6	13.9	6.7	5.3	23.6	12.7	3.9	18.5	8.7
PVD, %	3.8	8.3	5.1	5.1	15.1	10.1	4.9	15.4	8.3
AFIB, %	5.5	26.4	15.6	8.9	31.9	21.5	7.8	28.4	19.1
Index hospitalization									
LOS, d*	6 (4,8)	11 (8,20)	8 (5,13)	6 (5,10)	13 (8,24)	9 (6,14)	5 (3,8)	10 (6,18)	6 (4,11)
Cardiac catheterization, %	69.6	63.8	63.4	55.1	43.2	46	31.2	31.5	25.9
PCI, %	60.2	46.8	52.5	38.5	16.5	21.7	23.4	14.6	15.9
CABG, %	4.6	11.8	7.8	9.3	17.4	13.9	9.4	15.8	10
PCI or CABG, %	64.2	56.3	59.6	47.6	33.8	35.4	32.6	30.3	25.7
In-hospital death, %	5.6	17.4	NA	2.7	13.5	NA	0.6	6.7	NA
1-y mortality, %	7.3	26	8	5.6	27.7	13.5	2.8	20.5	8.9
Hospital survivors (n)	6800	1053	925	7986	1406	1174	4101	237	530
ACS rehospitalization, %	3.7	6.6	9.3	4.1	7.7	14.3	6	10.1	16.4
HF rehospitalization, %	0	22.8	31.4	0	29.9	37.1	0	25.7	36
All-cause rehospitalization, %	22.4	44.8	56.4	25.4	49.1	61.4	30.3	52.7	63.6
1-y death/HF hospitalization, %	1.7	28.1	33	3	37	40.3	2.2	32.9	38.1

Abbreviations: *CVD*, Cerebrovascular disease; *PVD*, peripheral vascular disease; *LOS, d*, length of stay in days for the index episode, including transfers.
Results of a proportional hazard model for postdischarge HF, with death as a competing risk.
* Median IQR.
† All except this comparison between no HF, index HF, and postdischarge HF groups are statistically significant at $P < .01$.

Table III. Factors associated with postdischarge HF for patients without index HF who survived the ACS hospitalization (n = 21516)*

	Sub-HR	95% CI	*P*
STEMI	1.00		
UA	0.72	0.65, 0.81	<.01
NSTEMI	0.79	0.72, 0.86	<.01
Age	1.04	1.03, 1.04	<.01
Diabetes	1.42	1.31, 1.55	<.01
Hypertension	1.12	1.03, 1.21	.01
Renal disease	1.53	1.34, 1.75	<.01
Atrial fibrillation	1.86	1.68, 2.06	<.01
COPD	1.47	1.32, 1.62	<.01
PCI/CABG	0.82	0.76, 0.89	<.01

Sex, cerebrovascular disease, peripheral vascular disease, and cancer eliminated from the model, as not significant.
* Results shown are for a proportional hazard model for post-discharge HF, with death as a competing risk.