Testing 30-day Risk-Standardized Mortality and Readmission Measures in All-Payer Data

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Introduction

The Centers for Medicare & Medicaid Services (CMS) publicly reports six National Quality Forum (NQF)-approved quality measures: hospital 30-day risk-standardized mortality rates (RSMRs) and readmission rates (RSRRs) for patients hospitalized for acute myocardial infarction (AMI), heart failure (HF), and pneumonia. The measures were developed for and are currently applied to Medicare fee-for-service (FFS) beneficiaries aged 65+ years. Three of the measures – AMI mortality, HF mortality, and HF readmission – are currently undergoing NQF endorsement maintenance. As part of the NQF endorsement maintenance process, the measure developers, YNHHSC/CORE, is performing analyses to determine whether CMS' publicly reported measures can be applied to and perform well in an all-payer patient population of adults aged 18 years and older. In this report, we detail our approach to addressing this question and present the findings.

The mortality and readmission measures employ administrative data, and are calculated using hierarchical logistic regression models to account for the clustering of observations within hospitals and differences in the number of admissions across hospitals. For risk adjustment, patient comorbidities are identified through claims data from each index hospitalization and from inpatient and outpatient Medicare claims during the 12 months before the index hospitalization. Reports that detail the original methodology for each measure, as well as subsequent measures maintenance technical reports, are available on the *QualityNet* Web site (http://www.qualitynet.org).The mortality and readmission measure results are posted on the *Hospital Compare* Web site (http://www.hospitalcompare.hhs.gov).

The results support expanding the measure patient population to include all-payer patients aged 18-64 years without changes to current measure specifications. Based on the results presented below, we conclude that the AMI mortality, HF mortality, and HF readmission measures perform well when applied to all-payer data (all patients aged 18+ years). Model testing demonstrated both strong patient-level model performance and consistent hospital-level results.

Methods

Data Source: For our analyses, we used all-payer data from California in addition to CMS data for Medicare FFS 65+ patients in California hospitals. California is a diverse state, and, with more than 37 million residents, California represents 12% of the US population. We used the California Patient Discharge Data, a large, linked database of patient hospital admissions. In 2006, there were approximately 3 million adult discharges from more than 450 hospitals. Records are linked by a unique patient identification number, allowing us to determine patient history from previous hospitalizations and to evaluate rates of both readmission and mortality (via linking with California vital statistics records).

Using all-payer data from California as well as CMS Medicare FFS data for California hospitals, we performed analyses to determine whether the publicly reported measures can be applied to

all adult patients, including not only FFS Medicare patients 65+ but also non-FFS Medicare patients 65+ and younger patients aged 18-64 years. The CMS models use inpatient and outpatient data for risk adjustment and were validated against medical record-based models in a subset of patients aged 65 and over.[1-6] Therefore, showing that the measures can be used in all-payer data requires answering two main questions:

Question 1: Given that outpatient claims are not available in the all-payer data set, how do the current CMS models perform when using only admission claims data (i.e., hospital claims for admitted patients)?

Question 2: When applied to all patients 18+, do the models perform well both at the patient level and at the hospital level? That is, at the patient level, is there good discrimination, predictive ability, and model fit across patient subgroups when we add new patients? In addition, when new patients are added, do potential differences in the effect of risk factors across patient subgroups affect risk prediction at the patient level (reclassification analysis) and risk profiling at the hospital level?

Question 1 analyses: Limiting risk-adjustment data to inpatient claims

To address the question of how the models perform when using only admission claims data, we used CMS data on FFS 65+ patients from California hospitals. Specifically, we created 2006 measure cohorts with complete one-year history data and 30-day follow-up data. For each of the three measures in NQF endorsement maintenance, we:
- A.   Examined the frequency (prevalence) of risk factors using all Part B, hospital outpatient history, and admission claims (history and current) according to current model specifications vs. using only admission claims data (history and current).
- B.   Fit the model separately using the full data and using only admission claims data and (a) compared the odds ratios (ORs) for the various risk factors; (b) conducted a reclassification analysis to compare risk prediction at the patient level; (c) compared model performance in terms of the c-statistic (discrimination); and (d) compared hospital-level risk-standardized rates (scatterplot, correlation coefficient, and R^2) to assess whether the model with only admission claims data is different from the current model in profiling hospital rates.

Question 2 analyses: Can the models be used in all-payer patient population of adults 18 years and older?

To address the main question of how well the models perform when applied to all patients 18+, we used the California Patient Discharge Data. Specifically, we created 2006 measure cohorts with up to one year of hospital admission claims history and 30-day follow-up data. For each of the three measures in NQF endorsement maintenance, we:
- A.   Created the patient cohort using the CMS measure inclusion and exclusion criteria (with the exception of including all patients 18+), and compared the FFS

65+, non-FFS 65+, and 18-64 year-old patient subgroups with respect to the distribution of risk factors and the crude outcome rate.

B. Fit the model in all patients 18+ and (a) examined overall model performance in terms of the c-statistic; (b) compared performance (c-statistic, predictive ability) across the patient subgroups (FFS 65+, non-FFS 65+, all 65+, and all-payer 18-64); and (c) compared the distribution of Pearson residuals (model fit) across the patient subgroups.

C. Fit the model separately in each patient subgroup and compared ORs associated with the risk factors to assess differences in magnitude or direction of ORs between the subgroups.

D. Fit the model in all patients 18+ and tested interaction terms between age and each of the other risk factors.

E. Fit the model in all patients 18+ with interaction terms and compared performance (c-statistic, predictive ability) across the patient subgroups.

F. Fit the model in all patients 18+ with and without interaction terms and (a) conducted a reclassification analysis to compare risk prediction at the patient level; (b) compared the c-statistic; and (c) compared hospital-level risk-standardized rates (scatterplot, correlation coefficient, and R^2) to assess whether the model with interactions is different from the current model in profiling hospital rates.

Results

Question 1 analyses: Limiting risk-adjustment data to inpatient claims

A. The numbers of patients in the AMI mortality, HF mortality, and HF readmission cohorts are presented in **Figures 1a, 1b, and 1c**, respectively. For all three measures, the prevalence of most risk factors was lower when using only admission claims data (**Tables 1a-1c**).

B. However, the magnitude of effect for most risk factors was similar when comparing the model using full data and using only admission claims data (**Tables 2a-2c**). In addition, when comparing the model with full data and with only admission claims data, the reclassification analysis demonstrated good patient-level risk prediction for all three measures (**Tables 3a-3c**), and the c-statistic was similar (0.713 vs. 0.725 for AMI mortality; 0.681 vs. 0.684 for HF mortality; and 0.610 vs. 0.611 for HF readmission) (**Tables 4a-4c**). Moreover, when comparing the model with full data and with only admission claims data, hospital-level risk-standardized rates were highly correlated (r=0.982 and R^2=0.964 for AMI mortality; r=0.993 and R^2=0.987 for HF mortality; and r=0.986 and R^2=0.972 for HF readmission) (**Figures 2a-2c**).

Question 2 analyses: Can the models be used in all-payer patient population of adults 18 years and older?

A. The AMI mortality, HF mortality, and HF readmission cohorts are presented in **Figures 3a, 3b, and 3c**, respectively. As the results in **Tables 5a-5c** show, for each measure, there are some differences in the risk factor profile and crude outcome rate among patient subgroups. For example, across all three measures, patients aged 18-64 were significantly more likely than patients aged 65+ to be men. For AMI mortality (**Table 5a**), the prevalence of risk factors and the crude outcome rate were similar in FFS 65+ and non-FFS 65+ patients; however, values were generally substantially lower in younger patients 18-64 compared with those 65+. For HF mortality (**Table 5b**) and HF readmission (**Table 5c**), a similar pattern was found in terms of FFS 65+ and non-FFS 65+ patients having a comparable risk factor profile and crude outcome rate. In contrast to findings for the AMI mortality measure, though, prevalence estimates for many HF mortality and HF readmission risk factors were more similar between younger and older patients; in fact, prevalence estimates were higher in younger than older patients for some conditions, including diabetes and its complications, psychiatric and substance use disorders, and liver and biliary disease (**Tables 5b and 5c**). Finally, unlike for the two mortality measures, the crude outcome rate for HF readmission was similar in younger and older patients (**Table 5c**).

B. Nevertheless, when the current models were applied to all patients 18+, overall discrimination was good (c-statistic=0.765 for AMI mortality, 0.718 for HF mortality, and 0.638 for HF readmission). In addition, there was good discrimination and predictive ability in all subgroups of patients (**Tables 6a-6c and 7a-7c**). For HF readmission, both discrimination and predictive ability were actually found to be greater in newly added younger patients aged 18-64 than those aged 65+ (**Table 7c**). For the HF mortality measure, the predictive range was narrower among those 18-64, albeit still reasonable given the group's lower mortality rate, compared with those 65+ (**Table 7b**). Moreover, for all three measures, the distribution of Pearson residuals was comparable across the patient subgroups (**Tables 8a-8c**).

C. For all three measures, ORs were generally similar for FFS 65+ and non-FFS 65+ patients. For some risk factors, there were differences in magnitude of effect between younger and older patients (**Tables 9a-9c**).

D. For each measure, few significant age-by-risk-factor interaction terms were found (**Tables 10a-10c**).

E. Nevertheless, inclusion of the interaction terms did not substantively change the level of discrimination and predictive ability across the patient subgroups (**Tables 11a-11c**).

F. In addition, when comparing the model with and without interaction terms, the reclassification analysis demonstrated good patient-level risk prediction across measures (**Tables 12a-12c**), and the c-statistic was nearly identical (0.767 vs. 0.765 for AMI mortality; 0.720 vs. 0.718 for HF mortality; and 0.640 vs. 0.638 for HF readmission) (**Tables 13a-13c**). Finally, when comparing the model with and without interaction terms, hospital-level risk-standardized rates were highly

correlated (r=0.9988 and R^2=0.9976 for AMI mortality; r=0.9997 and R^2=0.9994 for HF mortality; and r=0.9979 and R^2=0.9958 for HF readmission) (**Figures 4a-4c**).

Conclusions

Based on the results presented above, we conclude that the AMI mortality, HF mortality, and HF readmission measures perform well when applied to all-payer data (all patients aged 18+). Although there are some statistically significant age-by-risk-factor interaction terms, we do not recommend changing the model variables (with the exception of the slight modification of changing "age-65" to fully continuous age), as the inclusion of the interactions did not substantively affect either patient-level model performance or hospital-level results. We have demonstrated that the models can be applied to all patients aged 18+ and that they perform well when using only admission claims data to determine patient history. Thus, based on these results, the measure specifications could be modified to include the 18 and over population and to allow for the use of admission claims only for risk adjustment when complete claims history (i.e., outpatient data) is unavailable.

The data set has some limitations. Data on previous admissions and 30-day readmissions are available only from California hospitals; however, it is unlikely that many measure-specific cohort patients sought hospital inpatient care outside the state. In addition, data on 30-day mortality outside the hospital are available only for deaths in California; however, it is unlikely that many measure-specific cohort patients died outside the state within 30 days of their index hospitalization.

In summary, the AMI mortality, HF mortality, and HF readmission measures perform well when used in all-payer data (all patients aged 18+). Model testing demonstrated both strong patient-level model performance and consistent hospital-level results.
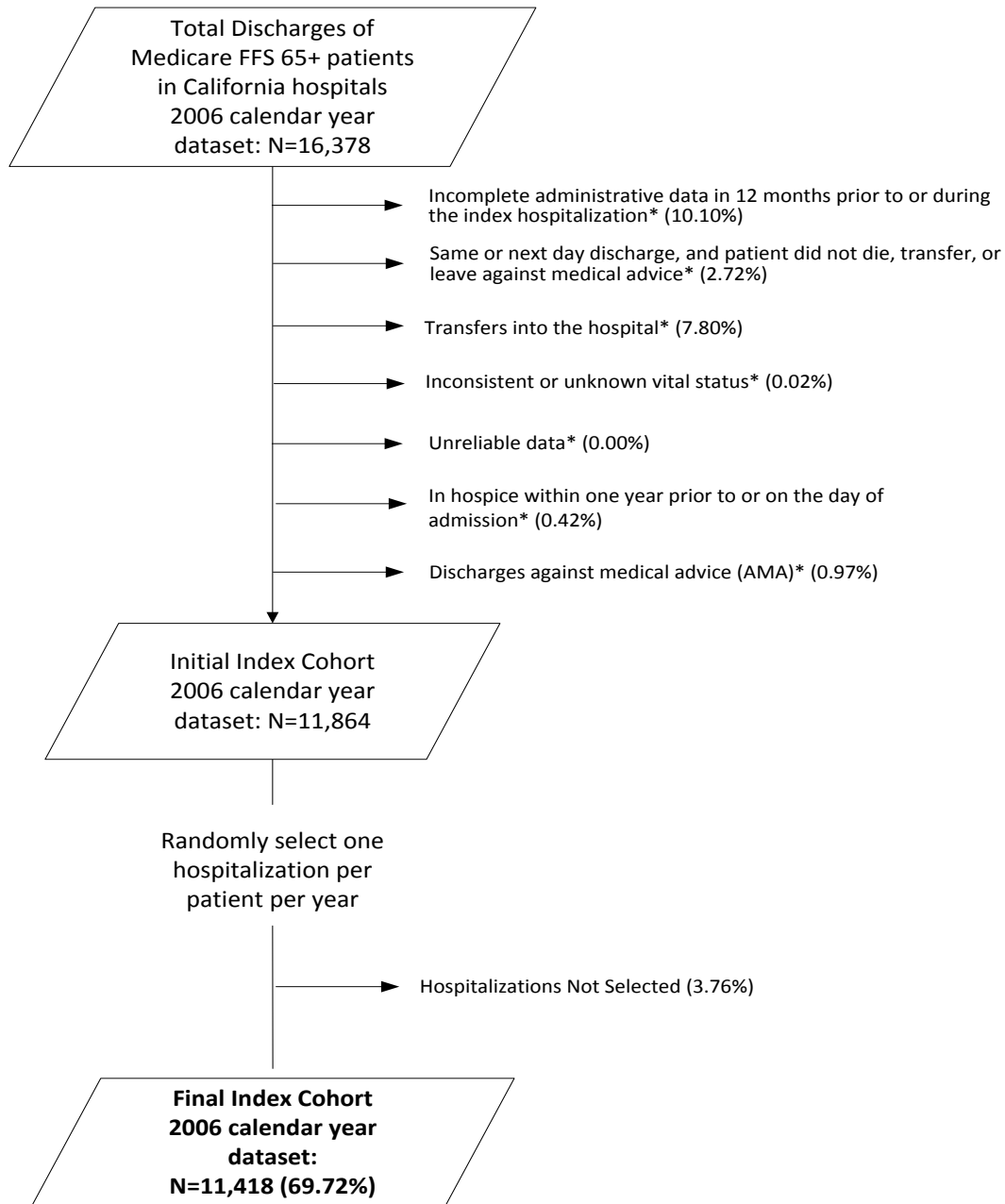
References

1. Krumholz HM, Wang Y, Mattera JA, Wang Y, Han LF, Ingber MJ, Roman S, Normand SL. An administrative claims model suitable for profiling hospital performance based on 30-day mortality rates among patients with an acute myocardial infarction. Circulation. 2006 Apr 4;113(13):1683-92.
2. Krumholz HM, Lin Z, Drye EE, Desai MM, Han LF, Rapp MT, Mattera JA, Normand SL. An administrative claims measure suitable for profiling hospital performance based on 30-day all-cause readmission rates among patients with acute myocardial infarction. Circ Cardiovasc Qual Outcomes. 2011 Mar 1;4(2):243-52.
3. Krumholz HM, Wang Y, Mattera JA, Wang Y, Han LF, Ingber MJ, Roman S, Normand SL. An administrative claims model suitable for profiling hospital performance based on 30-day mortality rates among patients with heart failure. Circulation. 2006 Apr 4;113(13):1693-701.
4. Keenan PS, Normand SL, Lin Z, Drye EE, Bhat KR, Ross JS, Schuur JD, Stauffer BD, Bernheim SM, Epstein AJ, Wang Y, Herrin J, Chen J, Federer JJ, Mattera JA, Wang Y, Krumholz HM. An administrative claims measure suitable for profiling hospital performance on the basis of

30-day all-cause readmission rates among patients with heart failure. Circ Cardiovasc Qual Outcomes. 2008 Sep;1(1):29-37.

5. Bratzler DW, Normand SL, Wang Y, O'Donnell WJ, Metersky M, Han LF, Rapp MT, Krumholz HM. An administrative claims model for profiling hospital 30-day mortality rates for pneumonia patients. PLoS One. 2011 Apr 12;6(4):e17401.

6. Lindenauer PK, Normand SL, Drye EE, Lin Z, Goodrich K, Desai MM, Bratzler DW, O'Donnell WJ, Metersky ML, Krumholz HM. Development, validation, and results of a measure of 30-day readmission following hospitalization for pneumonia. J Hosp Med. 2011 Mar;6(3):142-50.
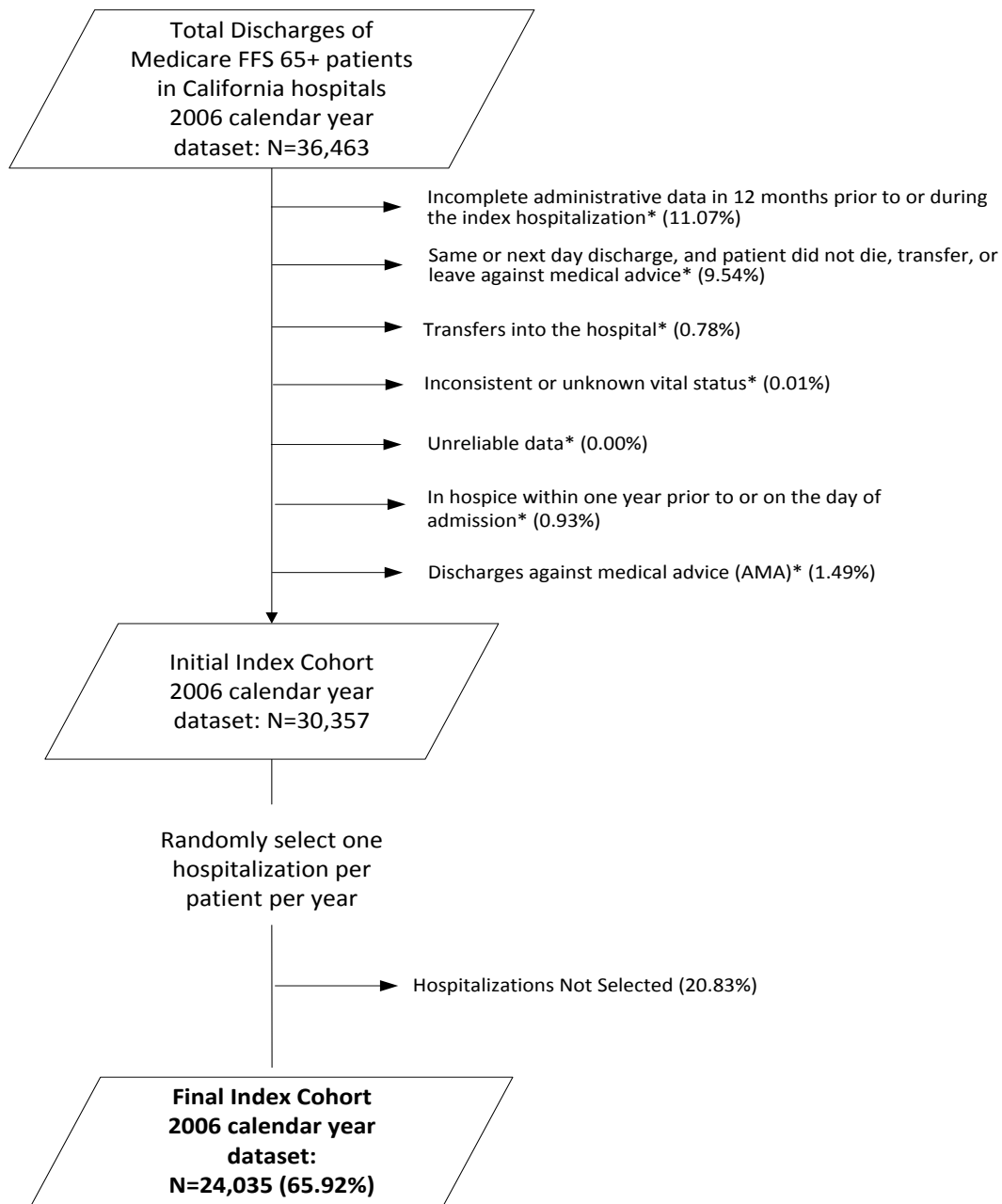
FIGURES AND TABLES

Figure 1a. 2006 AMI Mortality Cohort Using CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

Total Discharges of
Medicare FFS 65+ patients
in California hospitals
2006 calendar year
dataset: N=16,378

Incomplete administrative data in 12 months prior to or during the index hospitalization* (10.10%)

Same or next day discharge, and patient did not die, transfer, or leave against medical advice* (2.72%)

Transfers into the hospital* (7.80%)

Inconsistent or unknown vital status* (0.02%)

Unreliable data* (0.00%)

In hospice within one year prior to or on the day of admission* (0.42%)

Discharges against medical advice (AMA)* (0.97%)

Initial Index Cohort
2006 calendar year
dataset: N=11,864

Randomly select one
hospitalization per
patient per year

Hospitalizations Not Selected (3.76%)

**Final Index Cohort
2006 calendar year
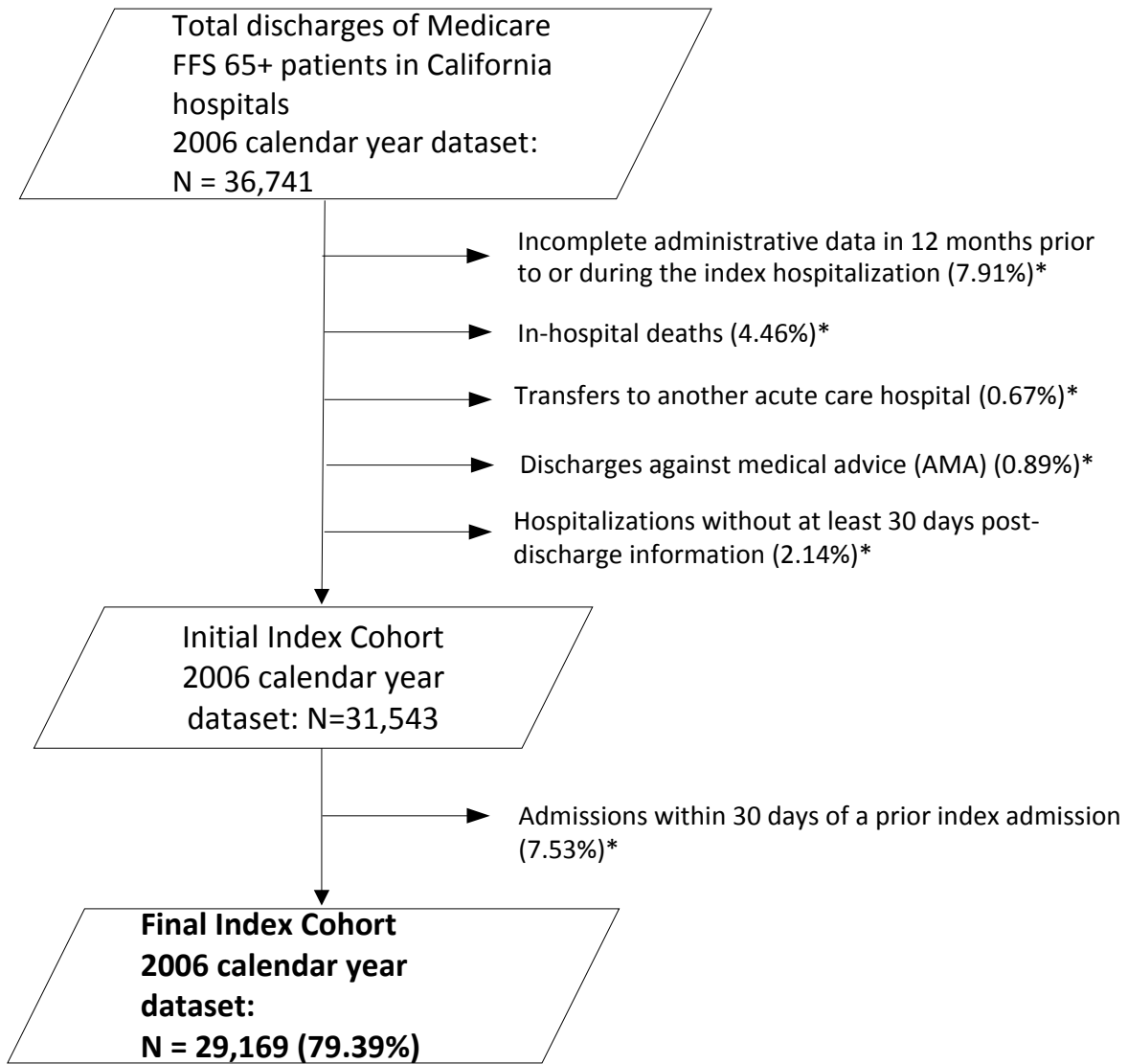dataset:
N=11,418 (69.72%)**

*Categories are not mutually exclusive

Figure 1b. 2006 HF Mortality Cohort Using CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

Total Discharges of
Medicare FFS 65+ patients
in California hospitals
2006 calendar year
dataset: N=36,463

Incomplete administrative data in 12 months prior to or during
the index hospitalization* (11.07%)

Same or next day discharge, and patient did not die, transfer, or
leave against medical advice* (9.54%)

Transfers into the hospital* (0.78%)

Inconsistent or unknown vital status* (0.01%)

Unreliable data* (0.00%)

In hospice within one year prior to or on the day of
admission* (0.93%)

Discharges against medical advice (AMA)* (1.49%)

Initial Index Cohort
2006 calendar year
dataset: N=30,357

Randomly select one
hospitalization per
patient per year

Hospitalizations Not Selected (20.83%)

**Final Index Cohort
2006 calendar year
dataset:
N=24,035 (65.92%)**

*Categories are not mutually exclusive

Figure 1c. 2006 HF Readmission Cohort Using CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

Total discharges of Medicare FFS 65+ patients in California hospitals
2006 calendar year dataset:
N = 36,741

→ Incomplete administrative data in 12 months prior to or during the index hospitalization (7.91%)*

→ In-hospital deaths (4.46%)*

→ Transfers to another acute care hospital (0.67%)*

→ Discharges against medical advice (AMA) (0.89%)*

→ Hospitalizations without at least 30 days post-discharge information (2.14%)*

Initial Index Cohort
2006 calendar year
dataset: N=31,543

→ Admissions within 30 days of a prior index admission (7.53%)*

**Final Index Cohort
2006 calendar year
dataset:
N = 29,169 (79.39%)**

* These categories are not mutually exclusive.

Table 1a. Prevalence of Risk Factors for AMI Mortality Model Using Full Data vs. Using Only Admission Claims Data (N=11,418)
Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

Risk Factor	Full data* #　(%)	Admission claims data only #　(%)
Demographics		
Age: Mean (range)	79.47 (65-110)	79.47 (65-110)
Male	5,676 (50)	5,676 (50)
Cardiovascular		
Percutaneous Transluminal Coronary Angioplasty	851 (7)	851 (7)
Coronary Artery Bypass Graft Surgery	615 (5)	615 (5)
Congestive Heart failure (CC 80)	3,690 (32)	1,922 (17)
Acute Myocardial Infarction (CC 81)	1,391 (12)	720 (6)
Unstable Angina (CC82)	1,744 (15)	458 (4)
Anterior Myocardial Infarction (ICD9 410.00-410.19)	1,567 (14)	1,567 (14)
Other Location of Myocardial Infarction (ICD9 410.20-410.69)	1,823 (16)	1,823 (16)
Chronic atherosclerosis (CC 83 or 84)	8,470 (74)	7,570 (66)
Cardio-respiratory failure and shock (CC 79)	953 (8)	423 (4)
Valvular or Rheumatic Heart Disease (CC 86)	3,500 (31)	2,292 (20)
Comorbidity		
Hypertension (CC 89, 91)	8,809 (77)	6,385 (56)
Stroke (CC 95 or 96)	1,031 (9)	237 (2)
Cerebrovascular Disease (CC 97 to 99, 103)	2,047 (18)	476 (4)
Renal Failure (CC 131)	1,912 (17)	1,229 (11)
Chronic Obstructive Pulmonary Disease (CC 108)	3,393 (30)	2,695 (24)
Pneumonia (CC 111 to 113)	2,831 (25)	1,857 (16)
Diabetes and DM Complications (CC 15 to 20, 120)	4,705 (41)	3,575 (31)
Protein-Calorie Malnutrition (CC 21)	421 (4)	373 (3)
Dementia and Senility (CC 49 or 50)	2,010 (18)	1,334 (12)
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	674 (6)	307 (3)
Vascular or Circulatory Disease (CC 104, 105)	2,493 (22)	780 (7)
Metastatic Cancer and Acute Leukemia (CC 7, 8)	423 (4)	292 (3)
Trauma (CC 154 to 156, 158 to 162)	3,449 (30)	1,010 (9)
Major Psych Disorders (CC 54 to 56)	680 (6)	218 (2)
Liver and Biliary Disease (CC 25 to 27)	156 (1)	106 (1)

* Including Part B, hospital outpatient, and hospital inpatient data.

Table 1b. Prevalence of Risk Factors for HF Mortality Models Using Full Data vs. Using Only Admission Claims Data (N=24,035)
Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

Risk Factor	Full data* # (%)	Admission Claims data only # (%)
Demographics		
Age: Mean (range)	80.92 (65-109)	80.92 (65-109)
MALE	10,479 (44)	10,479 (44)
Cardiovascular		
Percutaneous Transluminal Coronary Angioplasty	1,614 (7)	1,614 (7)
Coronary Artery Bypass Graft Surgery	2,552 (11)	2,552 (11)
Congestive Heart failure (CC 80)	17, 563 (73)	11,000 (46)
Acute Myocardial Infarction (CC 81)	2,092 (9)	1,773 (7)
Unstable Angina (CC82)	3,695 (15)	1,082 (5)
Chronic atherosclerosis (CC 83 or 84)	16,590 (69)	12,493 (56)
Cardio-respiratory failure and shock (CC 79)	4,659 (19)	2,300 (10)
Valvular or Rheumatic Heart Disease (CC 86)	11,602 (48)	7,658 (32)
Comorbidity		
Hypertension (CC 89, 91)	19,456 (81)	12,184 (55)
Stroke (CC 95 or 96)	2,634 (11)	672 (3)
Renal Failure (CC 131)	8,024 (33)	5,891 (25)
Chronic Obstructive Pulmonary Disease (CC 108)	11,182 (47)	9.315 (39)
Pneumonia (CC 111 to 113)	10,314 (43)	6,746 (28)
Diabetes and DM Complications (CC 15 to 20, 120)	11,878 (49)	9,635 (40)
Protein-Calorie Malnutrition (CC 21)	1,386 (6)	1,225 (5)
Dementia and Senility (CC 49 or 50)	4,748 (20)	3,100 (13)
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1,767 (7)	933 (4)
Peripheral vascular disease (CC 104, 105)	7,134 (30)	2,475 (10)
Metastatic Cancer and Acute Leukemia (CC 7, 8)	998 (4)	619 (3)
Trauma (CC 154 to 156, 158 to 162)	8,792 (37)	2,911 (12)
Major Psych Disorders (CC 54 to 56)	1,813 (8)	614 (3)
Liver and Biliary Disease (CC 25 to 27)	683 (3)	522 (2)

* Including Part B, hospital outpatient, and hospital inpatient data.

Table 1c. Prevalence of Risk Factors for HF Readmission Models Using Full Data vs. Using Only Admission Claims Data (N=29,169)
Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

Risk Factor	Full data* # (%)	Admission Claims data only # (%)
Demographics		
Age: Mean (range)	80.59 (65-109)	80.59 (65-109)
MALE	12,928 (44)	12,928 (44)
Cardiovascular		
History of CABG	3,460 (12)	3,460 (12)
Cardio-respiratory failure or shock (CC 79)	6,041 (21)	2,955 (10)
Congestive heart failure (CC 80)	22,103 (76)	14,388 (49)
Acute coronary syndrome (CC 81-82)	5,881 (20)	3,319 (11)
Coronary atherosclerosis or angina (CC 83-84)	20,843 (71)	17,162 (59)
Valvular or rheumatic heart disease (CC 86)	14,414 (49)	9,435 (32)
Specified arrhythmias (CC 92-93)	18,029 (62)	10,762 (37)
Other or unspecified heart disease (CC 94)	10,158 (35)	1,206 (4)
Vascular or circulatory disease (CC 104-106)	12,826 (44)	4,820 (17)
Comorbidity		
Metastatic cancer or acute leukemia (CC 7)	659 (2)	445 (2)
Cancer (CC 8-12)	5,698 (20)	2,134 (7)
Diabetes or DM complications (CC 15-20, 119-120)	14,801 (51)	12,185 (42)
Protein-calorie malnutrition (CC 21)	1,582 (5)	1,391 (5)
Disorders of fluid, electrolyte, acid-base (CC 22-23)	11,526 (40)	8,356 (29)
Liver or biliary disease (CC 25-30)	2,747 (9)	1,394 (5)
Peptic ulcer, hemorrhage, other specified gastrointestinal disorders (CC 34)	4,392 (15)	2,485 (9)
Other gastrointestinal disorders (CC 36)	14,040 (48)	7,436 (25)
Severe hematological disorders (CC 44)	1,384 (5)	670 (2)
Iron deficiency or other anemias and blood disease (CC 47)	15,619 (54)	10,914 (37)
Dementia or other specified brain disorders (CC 49-50)	5,586 (19)	3,565 (12)
Drug/alcohol abuse/dependence/psychosis (CC 51-53)	2,597 (9)	2,251 (8)
Major psychiatric disorders (CC 54-56)	2,222 (8)	732 (3)
Depression (CC 58)	3,022 (10)	2,135 (7)
Other psychiatric disorders (CC 60)	2,282 (8)	1,118 (4)
Hemiplegia, paraplegia, paralysis, functional disability (CC 67-69, 100-102, 177-178)	2,168 (7)	1,125 (4)
Stroke (CC 95-96)	3,200 (11)	799 (3)
Chronic obstructive pulmonary disease (CC 108)	13,663 (47)	11,348 (39)
Fibrosis of lung or other chronic lung disorders (CC 109)	3,874 (13)	1,239 (4)
Asthma (CC 110)	3,188 (11)	1,253 (4)
Pneumonia (CC 111-113)	12,572 (43)	7,963 (27)
End stage renal disease or dialysis (CC 129-130)	1,605 (6)	1,228 (4)
Renal failure (CC 131)	10,224 (35)	7,664 (26)
Nephritis (CC 132)	1,219 (4)	789 (3)
Other urinary tract disorders (CC 136)	9,843 (34)	4,867 (17)
Decubitus ulcer or chronic skin ulcer (CC 148-149)	3,441 (12)	1,611 (6)

* Including Part B, hospital outpatient, and hospital inpatient data.

Table 2a. Odds Ratios for Risk Factors in AMI Mortality Models With Full Data and With Only Admission Claims Data -- GLM (N=11,418)
Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

Risk Factor	Full data* OR (95% CI)	P-value	Admission claims data only OR (95% CI)	P-value
Intercept		<.0001		<.0001
Demographics				
Age-65 (years above 65, continuous)	1.05 (1.05-1.06)	<.0001	1.05 (1.05-1.06)	<.0001
Male	1.28 (1.15-1.42)	<.0001	1.26 (1.13-1.40)	<.0001
Cardiovascular				
Percutaneous Transluminal Coronary Angioplasty	0.65 (0.50-0.83)	0.0006	0.67 (0.52-0.86)	0.0018
Coronary Artery Bypass Graft Surgery	0.79 (0.61-1.02)	0.0738	0.86 (0.67-1.11)	0.2533
Congestive Heart failure (CC 80)	1.44 (1.27-1.62)	<.0001	1.91 (1.64-2.24)	<.0001
Acute Myocardial Infarction (CC 81)	1.26 (1.07-1.48)	0.0047	1.14 (0.92-1.41)	0.2417
Unstable Angina (CC82)	0.87 (0.74-1.02)	0.0898	1.23 (0.94-1.61)	0.1375
Anterior Myocardial Infarction (ICD9 410.00-410.19)	1.53 (1.32-1.76)	<.0001	1.52 (1.31-1.76)	<.0001
Other Location of Myocardial Infarction (ICD9 410.20-410.69)	1.36 (1.18-1.57)	<.0001	1.38 (1.19-1.59)	<.0001
Chronic atherosclerosis (CC 83 or 84)	0.51 (0.45-0.57)	<.0001	0.46 (0.41-0.51)	<.0001
Cardio-respiratory failure and shock (CC 79)	1.35 (1.13-1.61)	0.0008	1.08 (0.84-1.39)	0.5383
Valvular or Rheumatic Heart Disease (CC 86)	0.95 (0.85-1.06)	0.3578	0.97 (0.86-1.10)	0.6764
Comorbidity				
Hypertension (CC 89, 91)	0.73 (0.65-0.83)	<.0001	0.67 (0.61-0.75)	<.0001
Stroke (CC 95 or 96)	1.10 (0.92-1.31)	0.2881	1.17 (0.83-1.66)	0.3694
Cerebrovascular Disease (CC 97 to 99, 103)	1.18 (1.03-1.35)	0.017	1.44 (1.14-1.82)	0.0019
Renal Failure (CC 131)	1.36 (1.18-1.55)	<.0001	1.26 (1.06-1.50)	0.0075
Chronic Obstructive Pulmonary Disease (CC 108)	1.03 (0.92-1.16)	0.5754	0.99 (0.87-1.11)	0.8096
Pneumonia (CC 111 to 113)	1.36 (1.21-1.53)	<.0001	1.42 (1.25-1.62)	<.0001
Diabetes and DM Complications (CC 15 to 20, 120)	1.19 (1.07-1.33)	0.0014	1.05 (0.93-1.18)	0.4427
Protein-Calorie Malnutrition (CC 21)	1.27 (1.01-1.59)	0.0452	1.18 (0.92-1.51)	0.1837
Dementia and Senility (CC 49 or 50)	1.35 (1.19-1.54)	<.0001	1.48 (1.28-1.71)	<.0001
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1.47 (1.21-1.79)	0.0001	1.30 (0.96-1.76)	0.0948
Vascular or Circulatory Disease (CC 104, 105)	0.99 (0.87-1.13)	0.8827	0.96 (0.78-1.18)	0.6939
Metastatic Cancer and Acute Leukemia (CC 7, 8)	1.91 (1.52-2.40)	<.0001	2.83 (2.18-3.67)	<.0001
Trauma (CC 154 to 156, 158 to 162)	0.94 (0.84-1.05)	0.2855	0.89 (0.75-1.06)	0.1938
Major Psych Disorders (CC 54 to 56)	1.13 (0.93-1.39)	0.2154	1.35 (0.97-1.90)	0.079
Liver and Biliary Disease (CC 25 to 27)	1.34 (0.90-1.99)	0.1516	1.75 (1.10-2.76)	0.0173

* Including Part B, hospital outpatient, and hospital inpatient data.

Table 2b. Odds Ratios for Risk Factors in HF Mortality Models With Full Data and With Only Admission Claims Data -- GLM (N=24,035)
Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

Risk Factor	Full data*		Admission Claims data only	
	OR (95% CI)	P-value	OR (95% CI)	P-value
Intercept		<.0001		<.0001
Demographics				
Age-65 (years above 65, continuous)	1.05 (1.04-1.06)	<.0001	1.05 (1.04-1.06)	<.0001
Male	1.24 (1.14-1.35)	<.0001	1.24 (1.14-1.35)	<.0001
Cardiovascular				
Percutaneous Transluminal Coronary Angioplasty	0.61 (0.50-0.75)	<.0001	0.61 (0.49-0.74)	<.0001
Coronary Artery Bypass Graft Surgery	0.72 (0.62-0.85)	<.0001	0.75 (0.64-0.88)	0.0003
Congestive Heart failure (CC 80)	1.19 (1.07-1.32)	0.0013	1.24 (1.12-1.37)	<.0001
Acute Myocardial Infarction (CC 81)	1.53 (1.32-1.77)	<.0001	1.61 (1.39-1.87)	<.0001
Unstable Angina (CC82)	0.95 (0.83-1.08)	0.3934	0.88 (0.71-1.09)	0.2376
Chronic atherosclerosis (CC 83 or 84)	0.86 (0.78-0.95)	0.0016	0.89 (0.81-0.97)	0.0079
Cardio-respiratory failure and shock (CC 79)	1.17 (1.06-1.30)	0.0028	1.11 (0.97-1.27)	0.1412
Valvular or Rheumatic Heart Disease (CC 86)	1.02 (0.94-1.11)	0.5859	1.08 (0.99-1.18)	0.0865
Comorbidity				
Hypertension (CC 89, 91)	0.65 (0.59-0.71)	<.0001	0.68 (0.62-0.74)	<.0001
Stroke (CC 95 or 96)	0.92 (0.81-1.05)	0.2245	1.18 (0.93-1.50)	0.1763
Renal Failure (CC 131)	1.30 (1.19-1.42)	<.0001	1.18 (1.07-1.31)	0.0016
Chronic Obstructive Pulmonary Disease (CC 108)	1.06 (0.98-1.16)	0.1646	1.09 (1.00-1.19)	0.0508
Pneumonia (CC 111 to 113)	1.37 (1.25-1.49)	<.0001	1.36 (1.25-1.49)	<.0001
Diabetes and DM Complications (CC 15 to 20, 120)	0.86 (0.79-0.94)	0.0008	0.82 (0.75-0.89)	<.0001
Protein-Calorie Malnutrition (CC 21)	1.74 (1.51-1.99)	<.0001	1.70 (1.47-1.97)	<.0001
Dementia and Senility (CC 49 or 50)	1.37 (1.24-1.50)	<.0001	1.35 (1.21-1.51)	<.0001
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1.08 (0.92-1.26)	0.3506	1.10 (0.89-1.36)	0.3955
Peripheral vascular disease (CC 104, 105)	0.95 (0.87-1.04)	0.2747	1.07 (0.94-1.22)	0.3274
Metastatic Cancer and Acute Leukemia (CC 7, 8)	1.96 (1.66-2.31)	<.0001	2.66 (2.20-3.23)	<.0001
Trauma (CC 154 to 156, 158 to 162)	1.06 (0.97-1.15)	0.1941	1.07 (0.95-1.21)	0.2413
Major Psych Disorders (CC 54 to 56)	0.97 (0.84-1.13)	0.7309	0.92 (0.71-1.20)	0.5269
Liver and Biliary Disease (CC 25 to 27)	1.24 (0.99-1.57)	0.0635	1.24 (0.96-1.62)	0.1052

* Including Part B, hospital outpatient, and hospital inpatient data.

Table 2c. Odds Ratios for Risk Factors in HF Readmission Models With Full Data and With Only Admission Claims Data -- GLM (N=24,035)
Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

Risk Factor	Full data*		Admission Claims data only	
	OR (95% CI)	P-value	OR (95% CI)	P-value
Intercept		<.0001		<.0001
Demographics				
Age-65 (years above 65, continuous)	1.00 (1.00-1.00)	0.9992	1.00 (1.00-1.00)	0.8769
Male	1.01 (0.95-1.07)	0.8044	1.03 (0.97-1.09)	0.3707
Cardiovascular				
History of CABG	0.94 (0.86-1.03)	0.1682	0.95 (0.87-1.04)	0.2746
Cardio-respiratory failure or shock (CC 79)	1.15 (1.07-1.23)	0.0002	1.11 (1.01-1.21)	0.0292
Congestive heart failure (CC 80)	1.14 (1.06-1.23)	0.0007	1.18 (1.09-1.27)	<.0001
Acute coronary syndrome (CC 81-82)	1.07 (1.00-1.15)	0.0531	1.02 (0.93-1.11)	0.7399
Coronary atherosclerosis or angina (CC 83-84)	1.16 (1.08-1.24)	<.0001	1.13 (1.06-1.20)	0.0001
Valvular or rheumatic heart disease (CC 86)	1.07 (1.01-1.13)	0.0302	1.10 (1.03-1.16)	0.0023
Specified arrhythmias (CC 92-93)	1.01 (0.95-1.08)	0.7362	1.06 (0.99-1.13)	0.0886
Other or unspecified heart disease (CC 94)	1.03 (0.97-1.10)	0.2825	0.92 (0.80-1.06)	0.2473
Vascular or circulatory disease (CC 104-106)	1.04 (0.98-1.10)	0.2619	1.09 (1.01-1.18)	0.0236
Comorbidity				
Metastatic cancer or acute leukemia (CC 7)	1.13 (0.94-1.36)	0.1792	1.37 (1.10-1.70)	0.0051
Cancer (CC 8-12)	1.05 (0.98-1.13)	0.1518	1.03 (0.92-1.15)	0.5988
Diabetes or DM complications (CC 15-20, 119-120)	1.10 (1.04-1.17)	0.0014	1.12 (1.06-1.19)	0.0001
Protein-calorie malnutrition (CC 21)	0.98 (0.87-1.10)	0.6993	1.01 (0.89-1.15)	0.8520
Disorders of fluid, electrolyte, acid-base (CC 22-23)	1.16 (1.09-1.24)	<.0001	1.16 (1.08-1.24)	<.0001
Liver or biliary disease (CC 25-30)	1.05 (0.95-1.15)	0.3477	1.06 (0.94-1.20)	0.3741
Peptic ulcer, hemorrhage, other specified gastrointestinal disorders (CC 34)	1.16 (1.07-1.25)	0.0003	1.12 (1.01-1.23)	0.0254
Other gastrointestinal disorders (CC 36)	1.04 (0.98-1.10)	0.2134	1.08 (1.01-1.15)	0.0214
Severe hematological disorders (CC 44)	1.13 (1.00-1.28)	0.0499	1.21 (1.02-1.44)	0.0270
Iron deficiency or other anemias and blood disease (CC 47)	1.04 (0.98-1.11)	0.1994	1.08 (1.01-1.14)	0.0189
Dementia or other specified brain disorders (CC 49-50)	1.03 (0.96-1.11)	0.4364	0.97 (0.89-1.06)	0.4934
Drug/alcohol abuse/dependence/psychosis (CC 51-53)	1.07 (0.97-1.18)	0.1618	1.02 (0.92-1.13)	0.7817
Major psychiatric disorders (CC 54-56)	1.07 (0.97-1.19)	0.1783	1.15 (0.97-1.35)	0.1128
Depression (CC 58)	1.05 (0.95-1.14)	0.3428	1.09 (0.98-1.20)	0.1213
Other psychiatric disorders (CC 60)	1.04 (0.94-1.15)	0.4868	1.09 (0.95-1.25)	0.2303
Hemiplegia, paraplegia, paralysis, functional disability (CC 67-69, 100-102, 177-178)	1.06 (0.95-1.17)	0.3042	1.17 (1.02-1.34)	0.0299
Stroke (CC 95-96)	1.02 (0.94-1.12_	0.6054	1.01 (0.86-1.19)	0.9054
Chronic obstructive pulmonary disease (CC 108)	1.11 (1.05-1.18)	0.0004	1.10 (1.04-1.17)	0.0011
Fibrosis of lung or other chronic lung disorders (CC 109)	1.09 (1.01-1.18)	0.0296	1.05 (0.92-1.20)	0.4591
Asthma (CC 110)	1.07 (0.99-1.17)	0.1064	1.03 (0.90-1.18)	0.6529
Pneumonia (CC 111-113)	1.10 (1.04-1.17)	0.0013	1.10 (1.03-1.17)	0.0048
End stage renal disease or dialysis (CC 129-130)	1.24 (1.10-1.40)	0.0004	1.43 (1.26-1.63)	<.0001
Renal failure (CC 131)	1.20 (1.12-1.29)	<.0001	1.20 (1.12-1.29)	<.0001
Nephritis (CC 132)	0.99 (0.87-1.13)	0.8937	0.91 (0.77-1.07)	0.2314
Other urinary tract disorders (CC 136)	1.09 (1.02-1.16)	0.0068	1.17 (1.09-1.25)	<.0001
Decubitus ulcer or chronic skin ulcer (CC 148-149)	1.18 (1.08-1.28)	0.0001	1.26 (1.13-1.41)	<.0001

* Including Part B, hospital outpatient, and hospital inpatient data.

Table 3a. Reclassification Table of Risk Categories for AMI Mortality Model with Full Data and With Only Admission Claims Data
Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

Model with Admissions Claims Only Data	Model with Full Data										
	0 to <5%		5% to <10%		10% to <20%		>=20%		Total		
	#	%	#	%	#	%	#	%	#	%	
Risk Category											
0 to <5%	383	3.35	219	1.92	12	0.11	0	0.00	614	5.38	
5% to <10%	98	0.86	2,143	18.77	811	7.10	27	0.24	3,079	26.97	
10% to <20%	8	0.07	468	4.10	2,825	24.74	709	6.21	4,010	35.12	Same category: 72.80
>=20%	0	0.00	29	0.25	725	6.35	2,961	25.93	3,715	32.54	Similar category: 99.33
Total	489	4.28	2,859	25.04	4,373	38.30	3,697	32.38	11,418	100.00	

Table 3b. Reclassification Table of Risk Categories for HF Mortality Model with Full Data and With Only Admission Claims Data
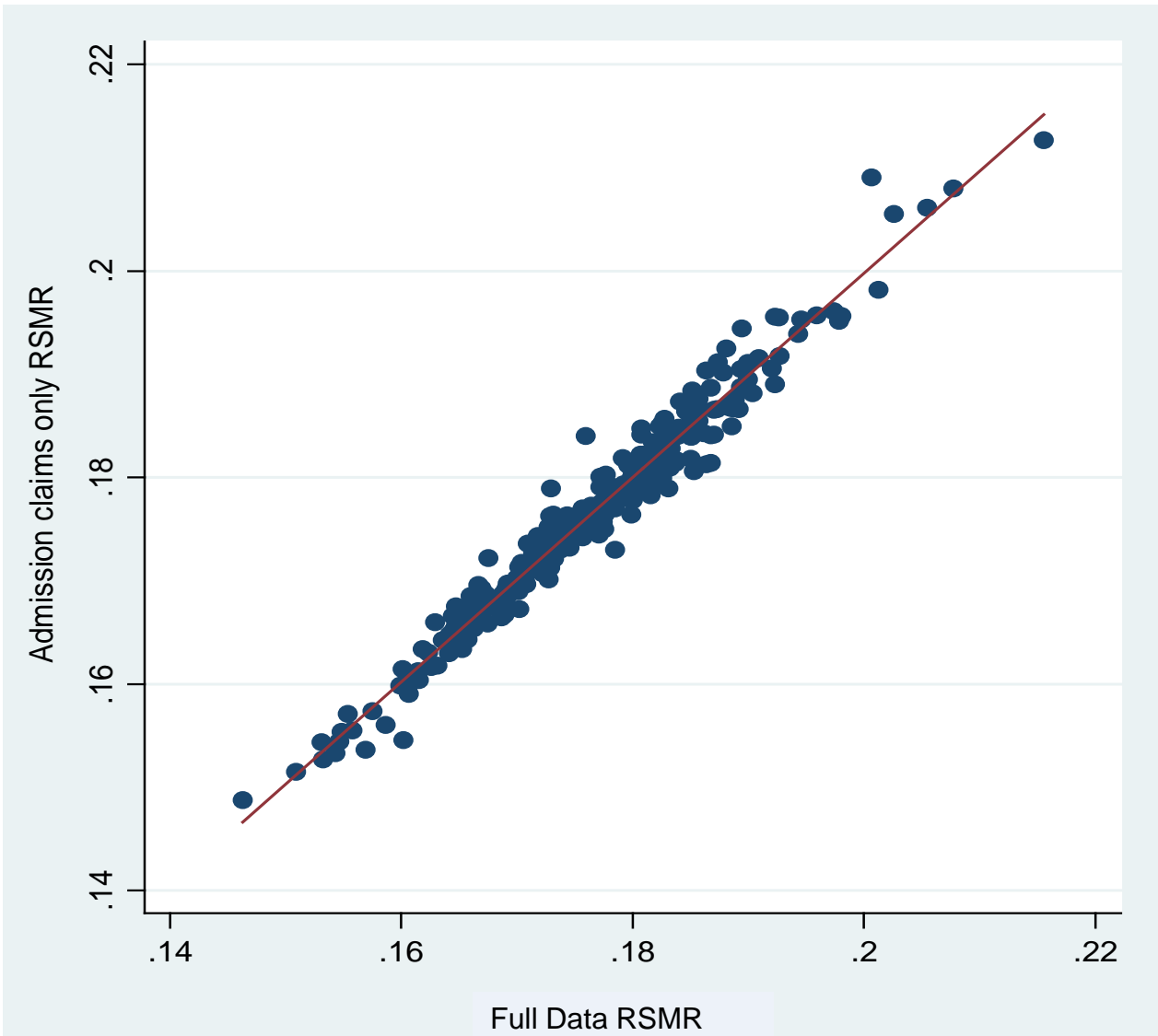**Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals**

Model with Admissions Claims Only Data	Model with Full Data										
	0 to <5%		5% to <10%		10% to <20%		>=20%		Total		
	#	%	#	%	#	%	#	%	#	%	
Risk Category											
0 to <5%	2,133	8.87	757	3.15	25	0.10	1	0.00	2,916	12.13	
5% to <10%	766	3.19	6,680	27.79	1,545	6.43	30	0.12	9,021	37.53	
10% to <20%	0	0.00	1,580	6.57	6,886	28.65	842	3.50	9,308	38.73	Same category: 73.36
>=20%	0	0.00	1	0.00	856	3.56	1,933	8.04	2,790	11.61	Similar category: 99.76
Total	2,899	12.06	9,018	37.52	9,312	38.74	2,806	11.67	24,035	100.00	

Table 3c. Reclassification Table of Risk Categories for HF Readmission Model with Full Data and With Only Admission Claims Data
Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

Model with Admissions Claims Only Data	Model with Full Data												
	0 to <15%		15% to <20%		20% to <25%		25% to <30%		>=30%		Total		
	#	%	#	%	#	%	#	%	#	%	#	%	
Risk Category													
0 to <15%	471	1.61	421	1.44	75	0.26	10	0.03	2	0.01	979	3.36	
15% to <20%	1,514	5.19	6,164	21.13	2,306	7.91	463	1.59	96	0.33	10,543	36.14	
20% to <25%	4	0.01	1,782	6.11	3,322	11.39	1,218	4.18	253	0.87	6,579	22.55	
25% to <30%	0	0.00	55	0.19	1,688	5.79	2,376	8.15	1,142	3.92	5,261	18.04	Same category: 57.41
>=30%	0	0.00	0	0.00	103	0.35	1,292	4.43	4,412	15.13	5,807	19.91	Similar category: 96.36
Total	1,989	6.82	8,422	28.87	7,494	25.69	5,359	18.37	5,905	20.24	29,169	100.00	

Table 4a. Performance of AMI Mortality Model With Full Data* and With Only Admission Claims Data
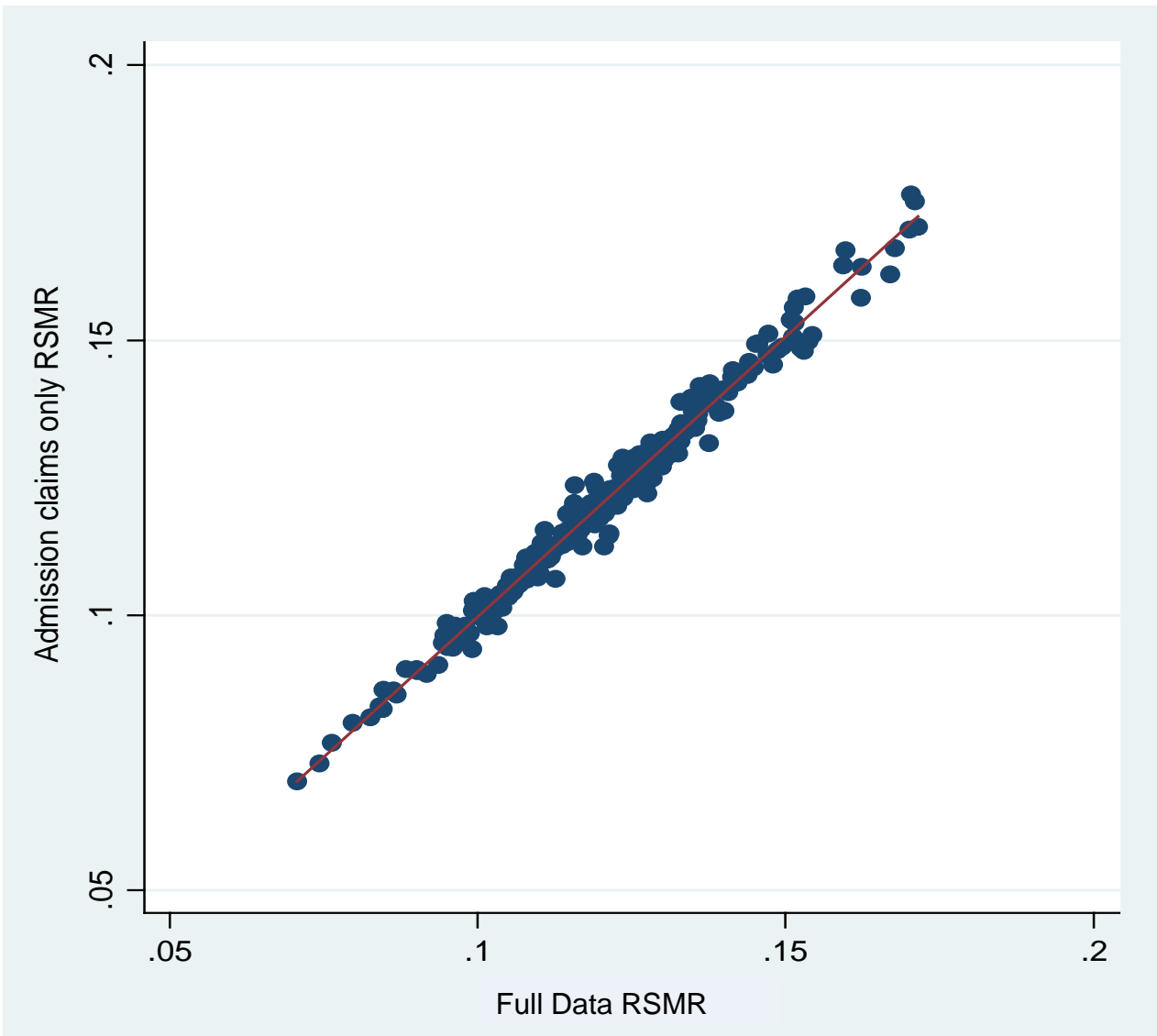**Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals**

	GLM model with full data	**GLM model with admission claims data only**
C-statistic	0.713	0.725

* Including Part B, hospital outpatient, and hospital inpatient data.

Figure 2a. Scatterplot of AMI 30-day Risk-Standardized Mortality Rates (RSMR30) from Model Using Full Data* and from Model Using Only Admission Claims Data (N=316 Hospitals)
Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals
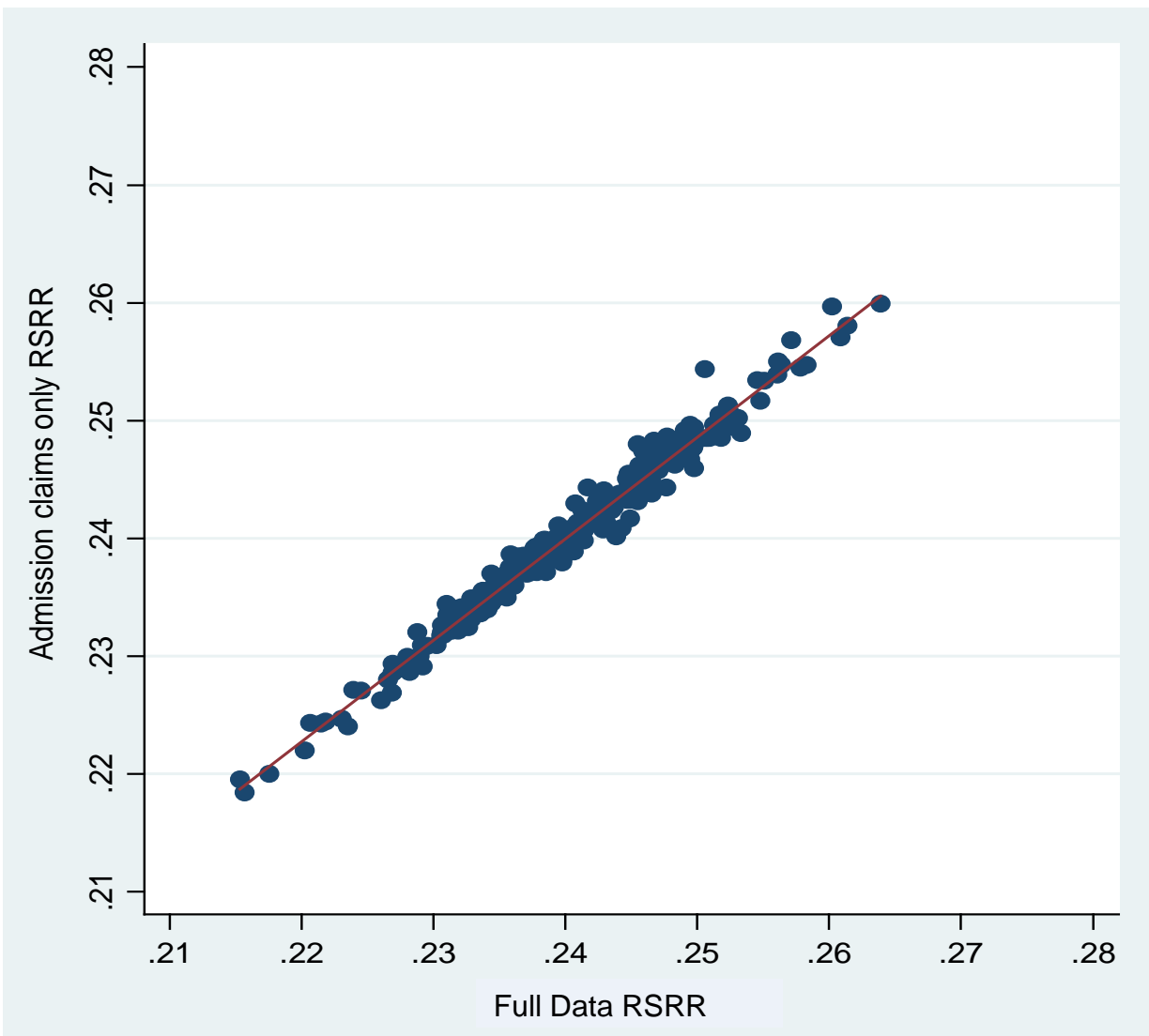

Correlation Coefficients (Weighted by Hospital Volume): 0.985

* Including Part B, hospital outpatient, and hospital inpatient data.

Table 4b. Performance of HF Mortality Models With Full Data* and With Only Admission Claims Data
Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

	GLM model with full data	GLM model with admission claims data
C-statistic	0.681	0.684

Figure 2b. Scatterplot of HF 30-day Risk-Standardized Mortality Rates (RSMR30) from Model Using Full Data* and from Model Using Only Admission Claims Data (N=330 Hospitals)
Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

Correlation Coefficients (Weighted by Hospital Volume): 0.993

* Including Part B, hospital outpatient, and hospital inpatient data.

Table 4c.Performance of HF Readmission Models With Full Data* and With Only Admission Claims Data
Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

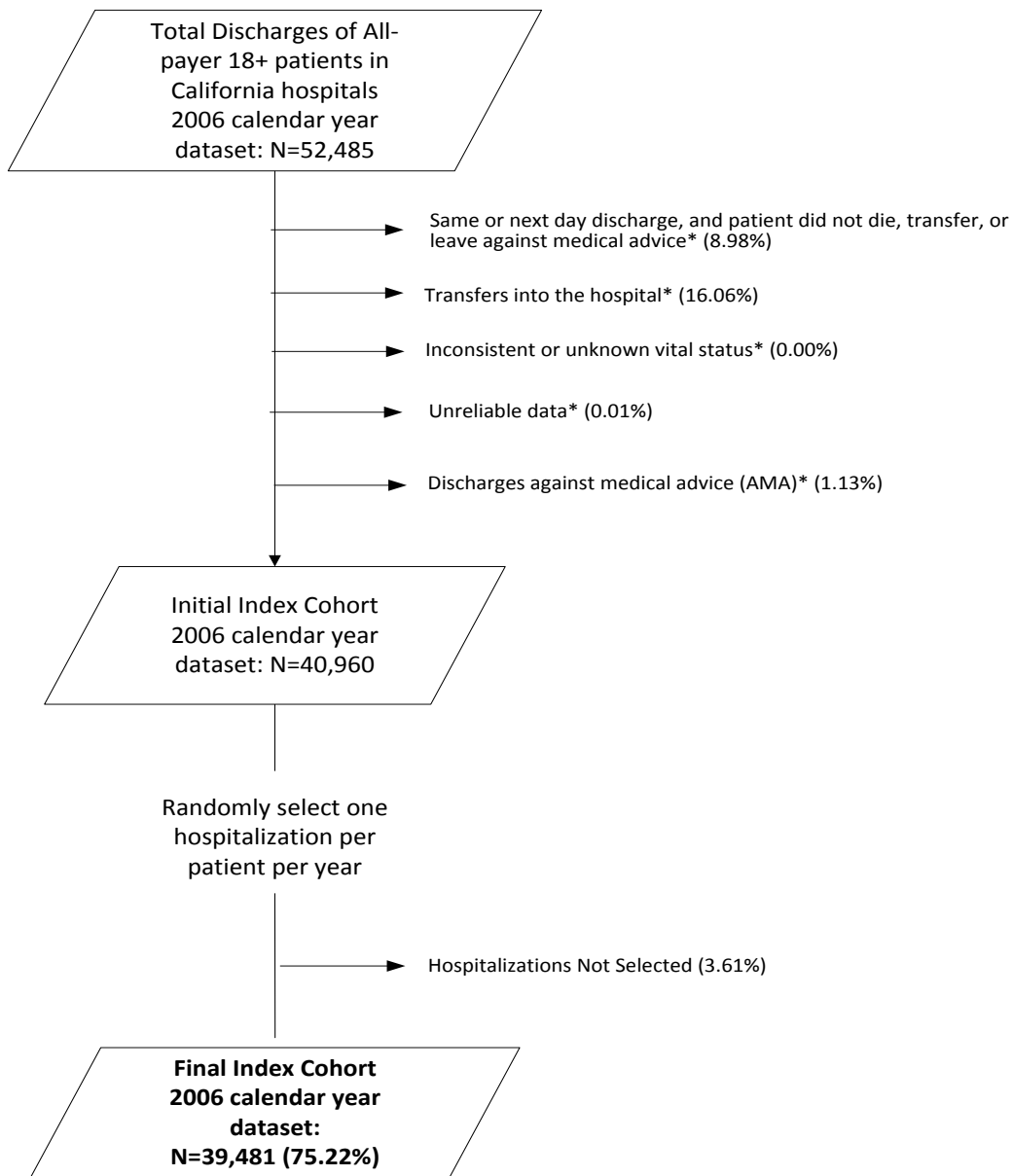|	GLM model with full data	GLM model with admission claims data
C-statistic	0.610	0.611

Figure 2c. Scatterplot of HF 30-day Risk-Standardized Readmission Rates (RSRR30) from Model Using Full Data* and from Model Using Only Admission Claims Data (N=335 Hospitals)
Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

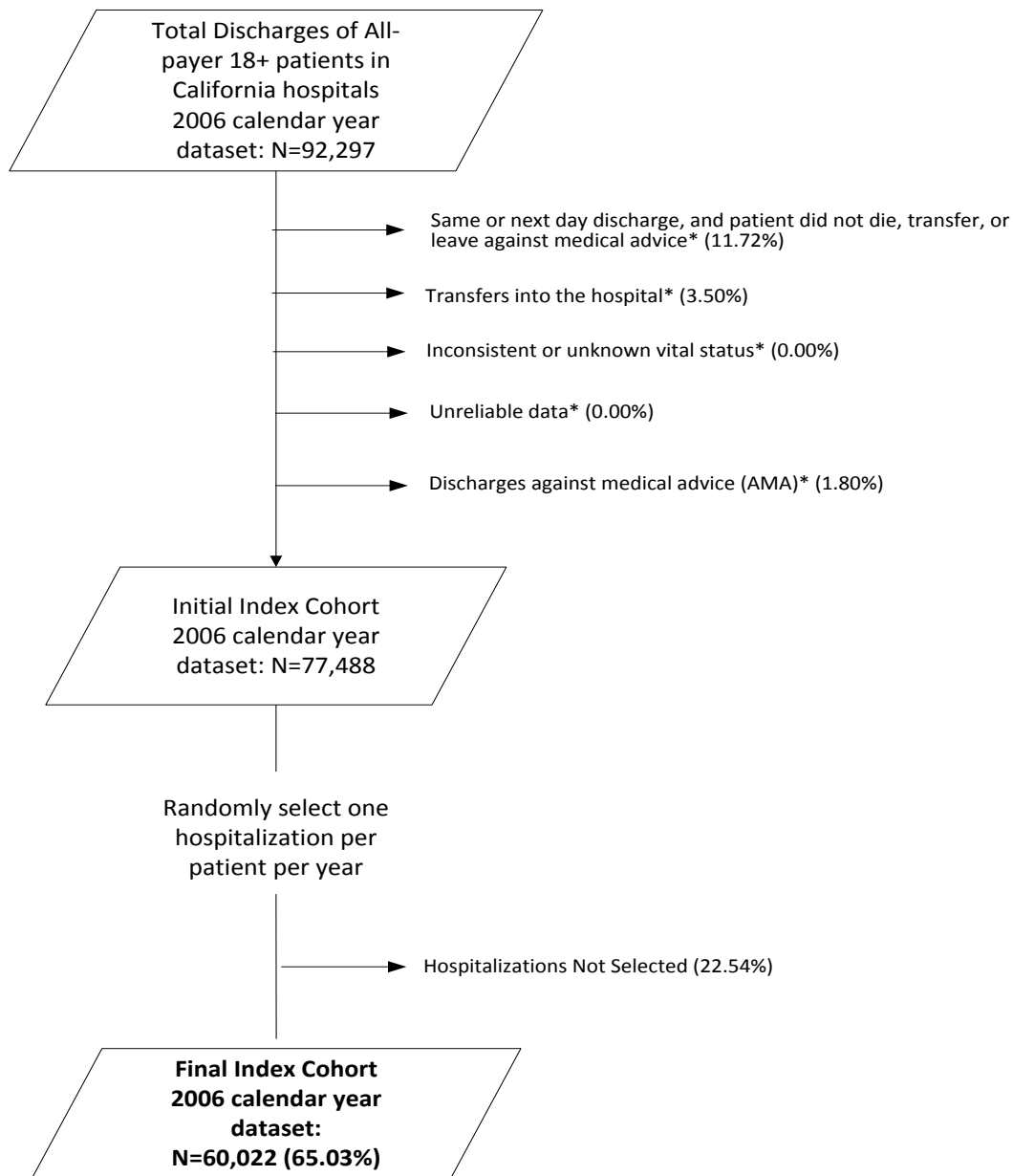Correlation Coefficients (Weighted by Hospital Volume): 0.986

* Including Part B, hospital outpatient, and hospital inpatient data.

Figure 3a. 2006 AMI Mortality Cohort Using California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Total Discharges of All-payer 18+ patients in California hospitals 2006 calendar year dataset: N=52,485

Same or next day discharge, and patient did not die, transfer, or leave against medical advice* (8.98%)

Transfers into the hospital* (16.06%)

Inconsistent or unknown vital status* (0.00%)

Unreliable data* (0.01%)

Discharges against medical advice (AMA)* (1.13%)

Initial Index Cohort 2006 calendar year dataset: N=40,960

Randomly select one hospitalization per patient per year

Hospitalizations Not Selected (3.61%)

Final Index Cohort 2006 calendar year dataset: N=39,481 (75.22%)
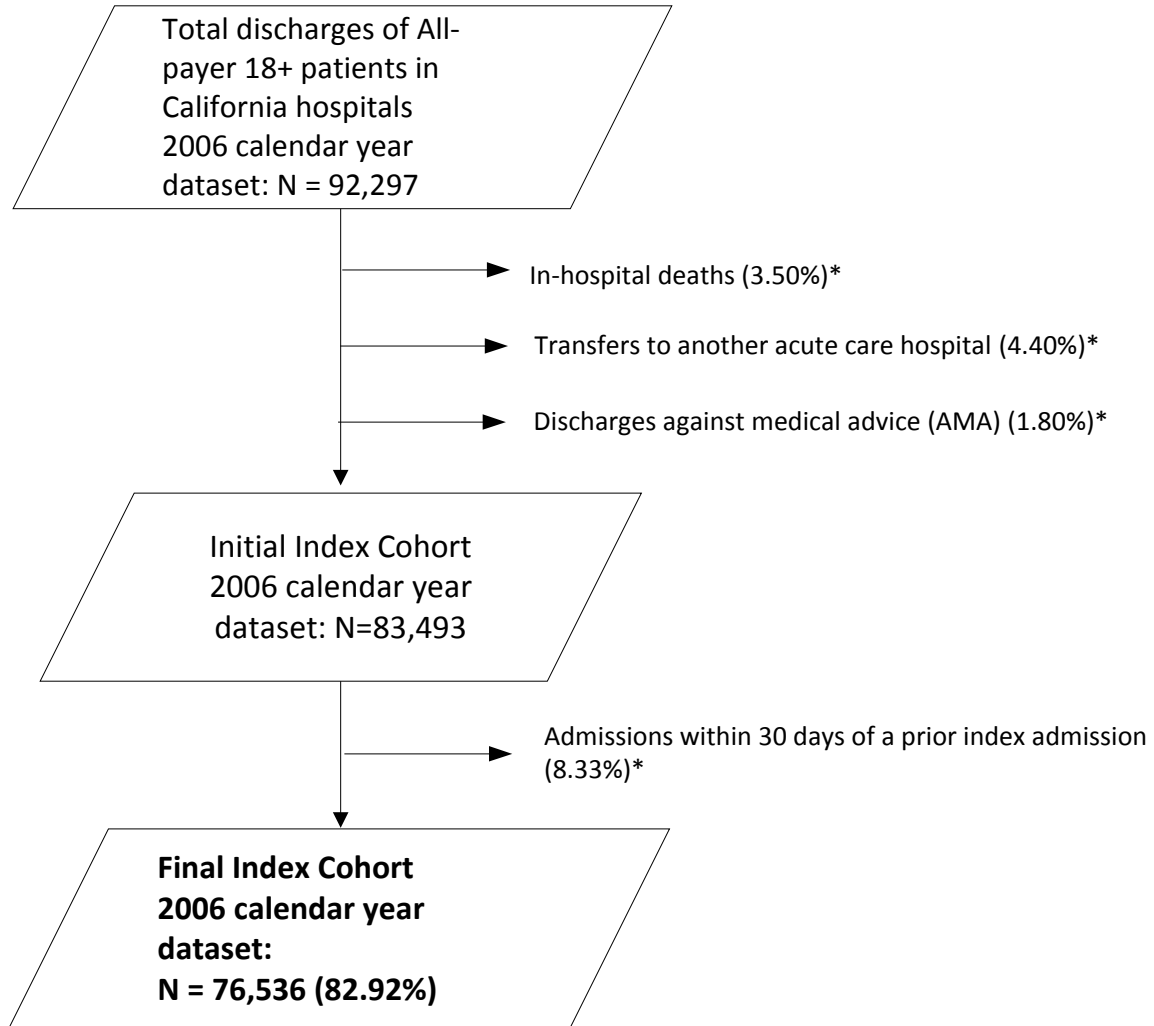
*Categories are not mutually exclusive

Figure 3b. 2006 HF Mortality Cohort Using California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Total Discharges of All-payer 18+ patients in California hospitals 2006 calendar year dataset: N=92,297

Same or next day discharge, and patient did not die, transfer, or leave against medical advice* (11.72%)

Transfers into the hospital* (3.50%)

Inconsistent or unknown vital status* (0.00%)

Unreliable data* (0.00%)

Discharges against medical advice (AMA)* (1.80%)

Initial Index Cohort 2006 calendar year dataset: N=77,488

Randomly select one hospitalization per patient per year

Hospitalizations Not Selected (22.54%)

Final Index Cohort 2006 calendar year dataset: N=60,022 (65.03%)

*Categories are not mutually exclusive

Figure 3c. 2006 HF Readmission Cohort Using California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Total discharges of All-payer 18+ patients in California hospitals 2006 calendar year dataset: N = 92,297

→ In-hospital deaths (3.50%)*

→ Transfers to another acute care hospital (4.40%)*

→ Discharges against medical advice (AMA) (1.80%)*

Initial Index Cohort 2006 calendar year dataset: N=83,493

→ Admissions within 30 days of a prior index admission (8.33%)*

Final Index Cohort 2006 calendar year dataset: N = 76,536 (82.92%)

* These categories are not mutually exclusive.

Table 5a. Prevalence of Risk Factors in AMI Mortality Model for All Patients Aged 18+ Years, FFS 65+ Patients, Non-FFS 65+ Patients, and All 18-64 Years Patients; Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Risk Factor	All 18+ (TOTAL) # (%)	FFS 65+ # (%)	Non-FFS 65+ # (%)	All 18-64 # (%)	P-value
All	39,481 (100)	13,347 (100)	11,214 (100)	14,920 (100)	
Demographics					
Age: Mean (SD)	69 (14)	79 (8)	78 (8)	54 (8)	0.0000
Male	23,977 (61)	6,682 (50)	6,099 (54)	11,196 (75)	0.0000
Cardiovascular					
Percutaneous Transluminal Coronary Angioplasty	4,637 (12)	1,594 (12)	1,290 (12)	1,753 (12)	0.5670
Coronary Artery Bypass Graft Surgery	3,490 (9)	1,406 (11)	1,337 (12)	747 (5)	0.0000
Congestive Heart failure (CC 80)	4,829 (12)	2,214 (17)	1,646 (15)	969 (6)	0.0000
Acute Myocardial Infarction (CC 81)	2,084 (5)	797 (6)	739 (7)	548 (4)	0.0000
Unstable Angina (CC82)	1,412 (4)	533 (4)	435 (4)	444 (3)	0.0000
Anterior Myocardial Infarction (ICD9 410.00-410.19)	5,773 (15)	1,800 (13)	1,280 (11)	2,693 (18)	0.0000
Other Location of Myocardial Infarction (ICD9 410.20-410.69)	7,715 (20)	2,111 (16)	1,682 (15)	3,922 (26)	0.0000
Chronic atherosclerosis (CC 83 or 84)	29,221 (74)	10,109 (76)	8,158 (73)	10,954 (73)	0.0000
Cardio-respiratory failure and shock (CC 79)	1,143 (3)	499 (4)	358 (3)	286 (2)	0.0000
Valvular or Rheumatic Heart Disease (CC 86)	5,746 (15)	2,733 (20)	2,014 (18)	999 (7)	0.0000
Comorbidity					
Hypertension (CC 89, 91)	24,388 (62)	8,503 (64)	7,437 (66)	8,448 (57)	0.0000
Stroke (CC 95 or 96)	618 (2)	279 (2)	229 (2)	110 (1)	0.0000
Cerebrovascular Disease (CC 97 to 99, 103)	1,698 (4)	817 (6)	621 (6)	260 (2)	0.0000
Renal Failure (CC 131)	3,378 (9)	1,409 (11)	1,176 (10)	793 (5)	0.0000
Chronic Obstructive Pulmonary Disease (CC 108)	7,181 (18)	3,175 (24)	2,283 (20)	1,723 (12)	0.0000
Pneumonia (CC 111 to 113)	4,865 (12)	2,265 (17)	1,657 (15)	943 (6)	0.0000
Diabetes and DM Complications (CC 15 to 20, 120)	14,462 (37)	5,062 (38)	4,375 (39)	5,025 (34)	0.0000
Protein-Calorie Malnutrition (CC 21)	1,015 (3)	537 (4)	325 (3)	153 (1)	0.0000
Dementia and Senility (CC 49 or 50)	3,641 (9)	2,145 (16)	1,359 (12)	137 (1)	0.0000
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1,230 (3)	527 (4)	387 (3)	316 (2)	0.0000
Vascular or Circulatory Disease (CC 104, 105)	2,475 (6)	1,102 (8)	849 (8)	524 (4)	0.0000
Metastatic Cancer and Acute Leukemia (CC 7, 8)	775 (2)	367 (3)	265 (2)	143 (1)	0.0000
Trauma (CC 154 to 156, 158 to 162)	1,835 (5)	875 (7)	627 (6)	333 (2)	0.0000
Major Psych Disorders (CC 54 to 56)	1,030 (3)	379 (3)	235 (2)	416 (3)	0.0003
Liver and Biliary Disease (CC 25 to 27)	634 (2)	152 (1)	112 (1)	370 (2)	0.0000
Outcome					
Death within 30-days of admission	4,667 (12)	2,257 (17)	1,736 (15)	674 (5)	0.0000

FFS is defined as payer category=Medicare and payer type of coverage=Traditional.

Table 5b. Prevalence of Risk Factors in HF Mortality Model with All 18+ Years Patients, FFS 65+ Years Patients, Non-FFS 65+ Years Patients, and All 18-64 Years Patients; Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Risk Factor	All 18+ (TOTAL) # (%)	FFS 65+ # (%)	Non-FFS 65+ # (%)	All 18-64 # (%)	P-value
All	60,022 (100)	27,977 (100)	16,447 (100)	15,598 (100)	
Demographics					
Age: Mean (SD)	73 (15)	81 (8)	80 (8)	53 (9)	0.0000
Male	29,241 (49)	12,120 (43)	7,640 (46)	9,481 (61)	0.0000
Cardiovascular					
Percutaneous Transluminal Coronary Angioplasty	5,720 (10)	2,937 (10)	1,553 (9)	1,230 (8)	0.0000
Coronary Artery Bypass Graft Surgery	10,026 (17)	5,435 (19)	3,105 (19)	1,486 (10)	0.0000
Congestive Heart failure (CC 80)	27,013 (45)	12,826 (46)	7,307 (44)	6,880 (44)	0.0005
Acute Myocardial Infarction (CC 81)	4,546 (8)	2,056 (7)	1,530 (9)	960 (6)	0.0000
Unstable Angina (CC82)	2,829 (5)	1,283 (5)	813 (5)	733 (5)	0.2285
Chronic atherosclerosis (CC 83, 84)	34,945 (58)	17,884 (64)	10,103 (61)	6,958 (45)	0.0000
Cardio-respiratory failure and shock (CC 79)	5,696 (9)	2,680 (10)	1,409 (9)	1,607 (10)	0.0000
Valvular or Rheumatic Heart Disease (CC 86)	17,416 (29)	8,874 (32)	5,252 (32)	3,290 (21)	0.0000
Comorbidity					
Hypertension (CC 89, 91)	36,660 (61)	17,174 (61)	10,485 (64)	9,001 (58)	0.0000
Stroke (CC 95, 96)	1,455 (2)	763 (3)	365 (2)	327 (2)	0.0000
Renal Failure (CC 131)	15,039 (25)	6,835 (24)	4,320 (26)	3,884 (25)	0.0001
Chronic Obstructive Pulmonary Disease (CC 108)	21,633 (36)	10,944 (39)	5,722 (35)	4,967 (32)	0.0000
Pneumonia (CC 111 to 113)	16,146 (27)	7,993 (29)	4,500 (27)	3,653 (23)	0.0000
Diabetes and DM Complications (CC 15 to 20, 120)	28,208 (47)	12,713 (45)	7,511 (46)	7,984 (51)	0.0000
Protein-Calorie Malnutrition (CC 21)	3,043 (5)	1,569 (6)	857 (5)	617 (4)	0.0000
Dementia and Senility (CC 49, 50)	7,463 (12)	4,871 (17)	2,342 (14)	250 (2)	0.0000
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	3,407 (6)	1,619 (6)	826 (5)	962 (6)	0.0000
Vascular or Circulatory Disease (CC 104, 105)	7,843 (13)	3,845 (14)	2,276 (14)	1,722 (11)	0.0000
Metastatic Cancer and Acute Leukemia (CC 7, 8)	1,369 (2)	741 (3)	412 (3)	216 (1)	0.0000
Trauma (CC 154 to 156, 158 to 162)	4,714 (8)	2,573 (9)	1,365 (8)	776 (5)	0.0000
Major Psych Disorders (CC 54 to 56)	2,646 (4)	1,107 (4)	467 (3)	1,072 (7)	0.0000
Liver and Biliary Disease (CC 25 to 27)	2,344 (4)	646 (2)	377 (2)	1,321 (8)	0.0000
Outcome					
Death within 30-days of admission	5,802 (10)	3,176 (11)	2,009 (12)	617 (4)	0.0000

FFS is defined as "Payer category is Medicare and Payer type of coverage is Traditional".

Table 5c. Prevalence of Risk Factors in HF Readmission Model with All 18+ Years Patients, FFS 65+ Years Patients, Non-FFS 65+ Years Patients, and All 18-64 Years Patients; Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Risk Factor	All 18+ (TOTAL) # (%)	FFS 65+ # (%)	Non-FFS 65+ # (%)	All 18-64 # (%)	P-value
All	76,536 (100)	33,784 (100)	20,989 (100)	21,763 (100)	
Demographics					
Age: Mean (SD)	72 (15)	80 (8)	80 (8)	53 (9)	0.0000
Male	37,918 (50)	14,833 (44)	9,777 (47)	13,308 (61)	0.0000
Cardiovascular					
Coronary Artery Bypass Graft Surgery	13,314 (17)	6,913 (20)	4,201 (20)	2,200 (10)	0.0000
Congestive Heart failure (CC 80)	37,883 (49)	16,853 (50)	10,029 (48)	11,001 (51)	0.0000
Acute coronary syndrome (CC 81, 82)	8,991 (12)	3,882 (11)	2,743 (13)	2,366 (11)	0.0000
Arrhythmias (CC 92, 93)	25,928 (34)	13,006 (38)	7,603 (36)	5,319 (24)	0.0000
Cardio-respiratory failure and shock (CC 79)	7,985 (10)	3,507 (10)	1,967 (9)	2,511 (12)	0.0000
Valvular or Rheumatic Heart Disease (CC 86)	22,138 (29)	10,905 (32)	6,609 (31)	4,624 (21)	0.0000
Vascular or Circulatory Disease (CC 104, 105, 106)	16,245 (21)	7,459 (22)	4,546 (22)	4,240 (19)	0.0000
Chronic atherosclerosis (CC 83, 84)	45,749 (60)	22,260 (66)	13,229 (63)	10,260 (47)	0.0000
Other and unspecified heart disease (CC 94)	5,633 (7)	2,302 (7)	1,538 (7)	1,793 (8)	0.0000
Comorbidity					
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	4,535 (6)	2,028 (6)	1,099 (5)	1,408 (6)	0.0000
Stroke (CC 95, 96)	1,868 (2)	916 (3)	489 (2)	463 (2)	0.0000
Renal Failure (CC 131)	20,819 (27)	9,066 (27)	5,819 (28)	5,934 (27)	0.0732
Chronic Obstructive Pulmonary Disease (CC 108)	27,939 (37)	13,334 (39)	7,337 (35)	7,268 (33)	0.0000
Diabetes and DM Complications (CC 15 to 20, 119, 120)	36,663 (48)	15,813 (47)	9,703 (46)	11,147 (51)	0.0000
Disorders of fluid/electrolyte/acid-base (CC22, 23)	21,763 (28)	10,090 (30)	5,359 (26)	6,314 (29)	0.0000
Other urinary tract disorders (CC 136)	16,267 (21)	7,823 (23)	4,379 (21)	4,065 (19)	0.0000
Decubitus ulcer or chronic skin ulcer (CC 148, 149)	4,988 (7)	2,035 (6)	1,331 (6)	1,622 (7)	0.0000
Other gastrointestinal disorders (CC 36)	26,683 (35)	12,767 (38)	7,274 (35)	6,642 (31)	0.0000
Peptic ulcer, hemorrhage, other specified gastrointestinal disorders (CC 34)	6,600 (9)	3,286 (10)	1,831 (9)	1,483 (7)	0.0000
Severe hematological disorders (CC 44)	1,325 (2)	648 (2)	328 (2)	349 (2)	0.0019
Nephritis (CC132)	4,955 (6)	1,602 (5)	1,403 (7)	1,950 (9)	0.0000
Dementia and Senility (CC 49, 50)	8,678 (11)	5,519 (16)	2,801 (13)	358 (2)	0.0000
Metastatic Cancer and Acute Leukemia (CC 7)	1,001 (1)	520 (2)	292 (1)	189 (1)	0.0000
Cancer (CC 8 to 12)	5,967 (8)	3,080 (9)	1,850 (9)	1,037 (5)	0.0000
Liver and biliary disease (CC 25 to 30)	6,737 (9)	2,031 (6)	1,235 (6)	3,471 (16)	0.0000
End-stage renal disease or dialysis (CC 129, 130)	3,925 (5)	1,392 (4)	750 (4)	1,783 (8)	0.0000
Asthma (CC 110)	5,423 (7)	1,813 (5)	1,105 (5)	2,505 (12)	0.0000
Iron deficiency and other/unspecified anemias and blood disease (CC 47)	35,339 (46)	16,765 (50)	9,653 (46)	8,921 (41)	0.0000

Table 5c. Prevalence of Risk Factors in HF Readmission Model with All 18+ Years Patients, FFS 65+ Years Patients, Non-FFS 65+ Years Patients, and All 18-64 Years Patients; Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Risk Factor	All 18+ (TOTAL) # (%)	FFS 65+ # (%)	Non-FFS 65+ # (%)	All 18-64 # (%)	P-value
Pneumonia (CC 111 to 113)	20,276 (26)	9,390 (28)	5,547 (26)	5,339 (25)	0.0000
Drug/alcohol abuse/dependence/psychosis (CC 51 to 53)	15,223 (20)	3,653 (11)	2,288 (11)	9,282 (43)	0.0000
Major pysch disorders (CC 54 to 56)	3,566 (5)	1,291 (4)	629 (3)	1,646 (8)	0.0000
Depression (CC 58)	10,059 (13)	4,223 (13)	2,535 (12)	3,301 (15)	0.0000
Other psychiatric disorders (CC 60)	5,329 (7)	2,186 (6)	1,278 (6)	1,865 (9)	0.0000
Fibrosis of lung and other chronic lung disorders (CC 109)	2,945 (4)	1,526 (5)	886 (4)	533 (2)	0.0000
Protein-Calorie Malnutrition (CC 21)	3,531 (5)	1,752 (5)	938 (4)	841 (4)	0.0000
Outcome					
Readmission within one month of discharge	17,938 (23)	7,922 (23)	4,668 (22)	5,348 (25)	0.0000

FFS is defined as "Payer category is Medicare and Payer type of coverage is Traditional".

Table 6a. Odds Ratios for Risk Factors in AMI Mortality Measure for All Patients 18+ Years (GLM, N=39,481, C-Statistic=0.765)

Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Risk Factor	OR (95% CI)	P-value
Intercept		0.0000
Demographics		
Age	1.05 (1.05-1.06)	0.0000
Male	1.12 (1.05-1.20)	0.0008
Cardiovascular		
Percutaneous Transluminal Coronary Angioplasty	0.81 (0.72-0.92)	0.0007
Coronary Artery Bypass Graft Surgery	1.16 (1.04-1.30)	0.0076
Congestive Heart failure (CC 80)	1.54 (1.38-1.71)	0.0000
Acute Myocardial Infarction (CC 81)	1.08 (0.94-1.24)	0.2920
Unstable Angina (CC82)	0.76 (0.63-0.92)	0.0042
Anterior Myocardial Infarction (ICD9 410.00-410.19)	1.74 (1.59-1.91)	0.0000
Other Location of Myocardial Infarction (ICD9 410.20-410.69)	1.42 (1.30-1.56)	0.0000
Chronic atherosclerosis (CC 83 or 84)	0.57 (0.53-0.61)	0.0000
Cardio-respiratory failure and shock (CC 79)	0.88 (0.74-1.04)	0.1322
Valvular or Rheumatic Heart Disease (CC 86)	1.18 (1.09-1.28)	0.0001
Comorbidity		
Hypertension (CC 89, 91)	0.70 (0.66-0.75)	0.0000
Stroke (CC 95 or 96)	1.26 (1.01-1.57)	0.0382
Cerebrovascular Disease (CC 97 to 99, 103)	1.24 (1.09-1.42)	0.0016
Renal Failure (CC 131)	1.19 (1.06-1.34)	0.0027
Chronic Obstructive Pulmonary Disease (CC 108)	1.10 (1.02-1.20)	0.0155
Pneumonia (CC 111 to 113)	1.60 (1.47-1.74)	0.0000
Diabetes and DM Complications (CC 15 to 20, 120)	1.27 (1.18-1.36)	0.0000
Protein-Calorie Malnutrition (CC 21)	1.60 (1.38-1.86)	0.0000
Dementia and Senility (CC 49 or 50)	1.51 (1.38-1.65)	0.0000
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1.25 (1.06-1.48)	0.0084
Vascular or Circulatory Disease (CC 104, 105)	1.12 (0.99-1.27)	0.0733
Metastatic Cancer and Acute Leukemia (CC 7, 8)	3.08 (2.61-3.62)	0.0000
Trauma (CC 154 to 156, 158 to 162)	1.12 (0.98-1.27)	0.0872
Major Psych Disorders (CC 54 to 56)	1.09 (0.90-1.31)	0.3774
Liver and Biliary Disease (CC 25 to 27)	2.25 (1.81-2.80)	0.0000

Table 6b. Odds Ratios of Risk Factors in HF Mortality Measure for All Patients 18+ Years (GLM, N=60,022, C-Statistic=0.718)
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Risk Factor	OR (95% CI)	P-value
Intercept		0.0000
Demographics		
Age	1.04 (1.04-1.05)	0.0000
Male	1.27 (1.20-1.35)	0.0000
Cardiovascular		
Percutaneous Transluminal Coronary Angioplasty	0.72 (0.64-0.80)	0.0000
Coronary Artery Bypass Graft Surgery	0.91 (0.84-0.98)	0.0168
Congestive Heart failure (CC 80)	1.31 (1.22-1.40)	0.0000
Acute Myocardial Infarction (CC 81)	1.34 (1.21-1.48)	0.0000
Unstable Angina (CC82)	0.81 (0.70-0.93)	0.0028
Chronic atherosclerosis (CC 83, 84)	1.03 (0.96-1.10)	0.4432
Cardio-respiratory failure and shock (CC 79)	1.05 (0.96-1.16)	0.2778
Valvular or Rheumatic Heart Disease (CC 86)	1.17 (1.10-1.24)	0.0000
Comorbidity		
Hypertension (CC 89, 91)	0.70 (0.66-0.75)	0.0000
Stroke (CC 95, 96)	1.14 (0.97-1.35)	0.1150
Renal Failure (CC 131)	1.11 (1.03-1.19)	0.0061
Chronic Obstructive Pulmonary Disease (CC 108)	1.12 (1.06-1.19)	0.0001
Pneumonia (CC 111 to 113)	1.30 (1.22-1.38)	0.0000
Diabetes and DM Complications (CC 15 to 20, 120)	0.89 (0.84-0.95)	0.0002
Protein-Calorie Malnutrition (CC 21)	1.90 (1.72-2.09)	0.0000
Dementia and Senility (CC 49, 50)	1.53 (1.42-1.64)	0.0000
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1.04 (0.92-1.18)	0.4939
Vascular or Circulatory Disease (CC 104, 105)	1.07 (0.98-1.16)	0.1323
Metastatic Cancer and Acute Leukemia (CC 7, 8)	2.84 (2.49-3.25)	0.0000
Trauma (CC 154 to 156, 158 to 162)	1.29 (1.18-1.41)	0.0000
Major Psych Disorders (CC 54 to 56)	0.93 (0.81-1.07)	0.3259
Liver and Biliary Disease (CC 25 to 27)	1.44 (1.25-1.66)	0.0000

Table 6c. Odds Ratios of Risk Factors in HF Readmission Measure for All Patients 18+ Years (GLM, N=76,536, C-Statistic=0.638)
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Risk Factor	OR (95% CI)	P-value
Intercept		0.0000
Demographics		
Age	1.00 (1.00-1.00)	0.0372
Male	1.02 (0.99-1.06)	0.1943
Cardiovascular		
Coronary Artery Bypass Graft Surgery	0.97 (0.92-1.01)	0.1613
Congestive Heart failure (CC 80)	1.22 (1.16-1.27)	0.0000
Acute coronary syndrome (CC 81, 82)	1.04 (0.99-1.10)	0.1150
Arrhythmias (CC 92, 93)	1.09 (1.05-1.14)	0.0000
Cardio-respiratory failure and shock (CC 79)	1.10 (1.04-1.16)	0.0007
Valvular or Rheumatic Heart Disease (CC 86)	1.08 (1.04-1.12)	0.0001
Vascular or Circulatory Disease (CC 104, 105, 106)	1.06 (1.01-1.11)	0.0177
Chronic atherosclerosis (CC 83, 84)	1.14 (1.10-1.19)	0.0000
Other and unspecified heart disease (CC 94)	1.03 (0.97-1.10)	0.3223
Comorbidity		
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1.07 (1.00-1.15)	0.0594
Stroke (CC 95, 96)	1.05 (0.94-1.16)	0.4159
Renal Failure (CC 131)	1.13 (1.08-1.18)	0.0000
Chronic Obstructive Pulmonary Disease (CC 108)	1.13 (1.09-1.18)	0.0000
Diabetes and DM Complications (CC 15 to 20, 119, 120)	1.12 (1.08-1.16)	0.0000
Disorders of fluid/electrolyte/acid-base (CC22, 23)	1.20 (1.15-1.25)	0.0000
Other urinary tract disorders (CC 136)	1.15 (1.10-1.20)	0.0000
Decubitus ulcer or chronic skin ulcer (CC 148, 149)	1.12 (1.05-1.20)	0.0006
Other gastrointestinal disorders (CC 36)	1.10 (1.06-1.14)	0.0000
Peptic ulcer, hemorrhage, other specified gastrointestinal disorders (CC 34)	1.02 (0.96-1.08)	0.5994
Severe hematological disorders (CC 44)	1.23 (1.09-1.39)	0.0007
Nephritis (CC132)	0.99 (0.93-1.07)	0.8744
Dementia and Senility (CC 49, 50)	0.97 (0.92-1.03)	0.3283
Metastatic Cancer and Acute Leukemia (CC 7)	1.16 (1.00-1.35)	0.0482
Cancer (CC 8 to 12)	1.02 (0.96-1.09)	0.5434
Liver and biliary disease (CC 25 to 30)	1.20 (1.13-1.27)	0.0000
End-stage renal disease or dialysis (CC 129, 130)	1.39 (1.29-1.50)	0.0000
Asthma (CC 110)	1.05 (0.98-1.12)	0.1539
Iron deficiency and other/unspecified anemias and blood disease (CC 47)	1.18 (1.13-1.23)	0.0000
Pneumonia (CC 111 to 113)	1.06 (1.02-1.11)	0.0027
Drug/alcohol abuse/dependence/psychosis (CC 51 to 53)	1.12 (1.07-1.17)	0.0000
Major pysch disorders (CC 54 to 56)	1.28 (1.18-1.38)	0.0000
Depression (CC 58)	1.06 (1.01-1.11)	0.0237
Other psychiatric disorders (CC 60)	1.18 (1.10-1.25)	0.0000
Fibrosis of lung and other chronic lung disorders (CC 109)	1.13 (1.04-1.23)	0.0047
Protein-Calorie Malnutrition (CC 21)	1.04 (0.96-1.13)	0.2912

Table 7a. AMI Mortality Model Performance for Models with All 18+ Patients and by Subgroups of Patients*
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Model with	N	C-statistic	SE	Lower	Upper	Predictive ability, % (lowest decile – highest decile)
All 65+	24,561	0.714	0.004	0.705	0.722	(0.00%, 34.77%)
FFS, 65+	13,347	0.712	0.006	0.701	0.723	(0.00%, 35.20%)
Non-FFS, 65+	11,214	0.715	0.007	0.702	0.728	(0.00%, 34.11%)
All 18-64	14,920	0.728	0.01	0.708	0.748	(1.47%, 31.15%)
All 18+ (overall)	**39,481**	**0.765**	**0.004**	**0.758**	**0.772**	**(1.47%, 34.71%)**

*Note that a single overall model for all 18+ is applied to the subgroups of patients

Table 7b. HF Mortality Model Performance for Models with All 18+ Patients and with Subgroups of Patients*
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Model with	N	C-statistic	SE	Lower	Upper	Predictive ability[#], % (lowest decile – highest decile)
All 65+	44,424	0.690	0.004	0.683	0.698	(2.31%, 25.26%)
FFS, 65+	27,977	0.690	0.005	0.681	0.700	(0.00%, 24.17%)
Non-FFS, 65+	16,447	0.693	0.006	0.680	0.705	(5.17%, 27.41%)
All 18-64	15,598	0.663	0.011	0.641	0.685	(1.96%, 14.06%)
All 18+ (overall)	**60,022**	**0.718**	**0.003**	**0.712**	**0.725**	**(1.97%, 25.14%)**

*Note that a single overall model for all 18+ is applied to the subgroups of patients

[#]Mean observation mortality in the lowest and the highest decile of the predicted mortality.

Table 7c. HF Readmission Model Performance for Models with All 18+ Patients and with Subgroups of Patients*
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Model with	N	C-statistic	SE	Lower	Upper	Predictive ability[#], % (lowest decile – highest decile)
All 65+	54,773	0.616	0.003	0.610	0.622	(13.89%, 39.14%)
FFS, 65+	33,784	0.617	0.004	0.610	0.624	(14.15%, 39.42%)
Non-FFS, 65+	20,989	0.614	0.005	0.604	0.623	(13.53%, 38.58%)
All 18-64	21,763	0.687	0.004	0.679	0.695	(9.93%, 49.41%)
All 18+ (overall)	**76,536**	**0.638**	**0.002**	**0.633**	**0.642**	**(13.03%, 43.20%)**

*Note that a single overall model for all 18+ is applied to the subgroups of patients

[#]Mean observation mortality in the lowest and the highest decile of the predicted mortality.

Table 8a. Distribution of Pearson Chi-Square Residuals for AMI Mortality Model by Patient Subgroups
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

	All 18+ (TOTAL)	All 65+	FFS 65+	Non-FFS 65+	All 18-64
N	39,481	24,561	13,347	11,214	14,920
Mean	-0.005	-0.002	-0.004	-0.001	-0.009
Std Deviation	0.978	0.994	0.994	0.995	0.950
100% Max	9.705	6.159	5.454	6.159	9.705
99%	4.088	3.512	3.418	3.566	5.062
95%	2.334	2.415	2.407	2.428	-0.089
90%	1.365	1.761	1.759	1.762	-0.122
75% Q3	-0.174	-0.245	-0.245	-0.244	-0.154
50% Median	-0.260	-0.335	-0.341	-0.329	-0.190
25% Q1	-0.379	-0.453	-0.464	-0.436	-0.231
10%	-0.527	-0.601	-0.617	-0.580	-0.282
5%	-0.640	-0.718	-0.739	-0.692	-0.321
1%	-0.902	-0.990	-1.025	-0.934	-0.446
0% Min	-2.385	-2.385	-2.385	-2.088	-1.683
Residual < -2	2 (0.01%)	2 (0.01%)	1 (0.01%)	1 (0.01%)	0 (0.00%)
-2 <= Residual < 0	34,812 (88.17%)	20,566 (83.73%)	11,809 (83.08%)	9,477 (84.51%)	14,246 (95.48%)
0 <= Residual < 2	2,089 (5.29%)	2,054 (8.36%)	1,219 (9.13%)	835 (7.45%)	35 (0.23%)
Residual >= 2	2,578 (6.53%)	1,939 (7.89%)	1,038 (7.78%)	901 (9.03%)	639 (4.28%)

Table 8b. Distribution of Pearson Chi-Square Residual for HF Mortality Models by Patient Subgroups
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

	All 18+ (TOTAL)	All 65+	FFS 65+	Non-FFS 65+	All 18-64
N	60,022	44,424	27,977	16,447	15,598
Mean	-0.0016	-0.0051	-0.0209	0.0219	0.0082
Std Deviation	0.9949	0.9844	0.9646	1.0168	1.0242
100% Max	13.3990	6.7464	5.9748	6.7464	13.3990
99%	4.2042	3.7393	3.6917	3.8302	5.7434
95%	2.5427	2.6158	2.5493	2.7077	-0.0954
90%	-0.0974	1.7596	1.6668	1.8785	-0.1183
75% Q3	-0.1880	-0.2410	-0.2427	-0.2370	-0.1478
50% Median	-0.2686	-0.3066	-0.3102	-0.3015	-0.1780
25% Q1	-0.3559	-0.3860	-0.3914	-0.3762	-0.2138
10%	-0.4508	-0.4796	-0.4870	-0.4656	-0.2593
5%	-0.5206	-0.5508	-0.5582	-0.5368	-0.2962
1%	-0.7020	-0.7395	-0.7493	-0.7223	-0.4051
0% Min	-1.6798	-1.6798	-1.6798	-1.6685	-0.7087
Residual < -2	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
-2 <= Residual < 0	54,220 (90.33%)	39,239 (88.33%)	24,801 (88.65%)	14,438 (87.79%)	14,981 (96.04%)
0 <= Residual < 2	1,275 (2.12%)	1,269 (2.86%)	811 (2.90%)	458 (2.78%)	6 (0.04%)
Residual >= 2	4,527 (7.54%)	3,916 (8.82%)	2,365 (8.45%)	1,551 (9.43%)	611 (3.92%)

Table 8c. Distribution of Pearson Chi-Square Residual for HF Readmission Models by Patient Subgroups
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

	All 18+ (TOTAL)	All 65+	FFS 65+	Non-FFS 65+	All 18-64
N	76,536	54,773	33,784	20,989	21,763
Mean	0.0000	0.0022	0.0065	-0.0047	-0.0055
Std Deviation	1.0000	1.0085	1.0112	1.0042	0.9782
100% Max	2.7554	2.7554	2.7554	2.7469	2.6472
99%	2.5027	2.5181	2.5123	2.5260	2.4500
95%	2.1716	2.1958	2.1894	2.2098	2.0945
90%	1.8238	1.8582	1.8512	1.8707	1.7320
75% Q3	-0.3777	-0.3769	-0.3755	-0.3792	-0.3798
50% Median	-0.4541	-0.4552	-0.4569	-0.4520	-0.4512
25% Q1	-0.5695	-0.5695	-0.5738	-0.5627	-0.5696
10%	-0.6948	-0.6883	-0.6936	-0.6778	-0.7128
5%	-0.7727	-0.7613	-0.7683	-0.7497	-0.8072
1%	-0.9336	-0.9071	-0.9132	-0.8979	-0.9902
0% Min	-1.5081	-1.4771	-1.2495	-1.4771	-1.5081
Residual < -2	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
-2 <= Residual < 0	58,598 (76.56%)	42,183 (77.01%)	25,862 (76.55%)	16,321 (77.76%)	16,415 (75.43%)
0 <= Residual < 2	12,263 (16.02%)	8,266 (15.09%)	5,323 (15.76%)	2,943 (14.02%)	3,997 (18.37%)
Residual >= 2	5,675 (7.41%)	4,324 (7.89%)	2,599 (7.69%)	1,725 (8.22%)	1,351 (6.21%)

Table 9a. Odds Ratios for Risk Factors in AMI Mortality Measure -- Stratified Results for FFS 65+ Patients, Non-FFS 65+ Patients, All 65+ Patients, and All 18-64 Patients
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Risk Factor	All 65+ (N=24,561, C-Statistic=0.714)		FFS 65+ (N=13,347, C-statistic=0.713)		Non-FFS 65+ (N= 11,214, C-statistic=0.719)		All 18-64 (N=14,920, C-Statistic=0.753)	
	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value
Intercept		0.000		0.000		0.000		0.000
Demographics								
Age	1.06 (1.05-1.06)	0.000	1.06 (1.05-1.06)	0.000	1.06 (1.05-1.07)	0.000	1.04 (1.02-1.05)	0.000
Male	1.16 (1.08-1.25)	0.000	1.17 (1.06-1.29)	0.002	1.16 (1.04-1.30)	0.008	1.06 (0.88-1.27)	0.560
Cardiovascular								
Percutaneous Transluminal Coronary Angioplasty	0.80 (0.70-0.91)	0.001	0.77 (0.65-0.92)	0.004	0.82 (0.68-1.00)	0.055	0.86 (0.65-1.15)	0.310
Coronary Artery Bypass Graft Surgery	1.15 (1.03-1.30)	0.016	1.24 (1.06-1.45)	0.007	1.05 (0.88-1.26)	0.556	1.16 (0.82-1.65)	0.402
Congestive Heart failure (CC 80)	1.58 (1.41-1.77)	0.000	1.70 (1.46-1.96)	0.000	1.42 (1.19-1.70)	0.000	1.24 (0.90-1.71)	0.186
Acute Myocardial Infarction (CC 81)	1.04 (0.89-1.21)	0.613	1.00 (0.81-1.23)	0.971	1.09 (0.87-1.36)	0.458	1.37 (0.94-2.01)	0.104
Unstable Angina (CC82)	0.79 (0.65-0.97)	0.024	0.90 (0.70-1.17)	0.449	0.67 (0.49-0.93)	0.015	0.63 (0.39-1.03)	0.068
Anterior Myocardial Infarction (ICD9 410.00-410.19)	1.71 (1.54-1.90)	0.000	1.67 (1.46-1.92)	0.000	1.81 (1.54-2.12)	0.000	1.96 (1.59-2.41)	0.000
Other Location of Myocardial Infarction (ICD9 410.20-410.69)	1.50 (1.36-1.66)	0.000	1.53 (1.34-1.76)	0.000	1.47 (1.26-1.72)	0.000	1.29 (1.05-1.59)	0.017
Chronic atherosclerosis (CC 83 or 84)	0.60 (0.55-0.65)	0.000	0.54 (0.49-0.61)	0.000	0.68 (0.60-0.77)	0.000	0.44 (0.37-0.53)	0.000
Cardio-respiratory failure and shock (CC 79)	0.86 (0.71-1.04)	0.110	0.89 (0.69-1.13)	0.330	0.83 (0.62-1.12)	0.219	0.92 (0.61-1.40)	0.695
Valvular or Rheumatic Heart Disease (CC 86)	1.12 (1.03-1.23)	0.009	1.01 (0.90-1.14)	0.826	1.29 (1.13-1.48)	0.000	1.79 (1.39-2.29)	0.000
Comorbidity								
Hypertension (CC 89, 91)	0.71 (0.65-0.76)	0.000	0.69 (0.63-0.76)	0.000	0.72 (0.65-0.81)	0.000	0.71 (0.60-0.84)	0.000
Stroke (CC 95 or 96)	1.31 (1.04-1.65)	0.021	1.08 (0.78-1.49)	0.641	1.63 (1.16-2.28)	0.005	0.91 (0.45-1.85)	0.787
Cerebrovascular Disease (CC 97 to 99, 103)	1.27 (1.11-1.47)	0.001	1.39 (1.16-1.67)	0.000	1.13 (0.91-1.42)	0.269	1.12 (0.69-1.80)	0.646
Renal Failure (CC 131)	1.11 (0.98-1.25)	0.106	1.20 (1.02-1.41)	0.032	0.99 (0.82-1.20)	0.954	1.70 (1.23-2.35)	0.001
Chronic Obstructive Pulmonary Disease (CC 108)	1.10 (1.01-1.20)	0.031	1.05 (0.94-1.18)	0.376	1.15 (1.01-1.32)	0.034	1.17 (0.93-1.46)	0.182
Pneumonia (CC 111 to 113)	1.53 (1.39-1.68)	0.000	1.54 (1.37-1.74)	0.000	1.52 (1.32-1.75)	0.000	2.08 (1.63-2.66)	0.000
Diabetes and DM Complications (CC 15 to 20, 120)	1.19 (1.10-1.28)	0.000	1.24 (1.12-1.37)	0.000	1.14 (1.02-1.28)	0.025	1.73 (1.46-2.06)	0.000
Protein-Calorie Malnutrition (CC 21)	1.53 (1.31-1.80)	0.000	1.28 (1.04-1.57)	0.022	2.05 (1.59-2.65)	0.000	2.05 (1.32-3.17)	0.001
Dementia and Senility (CC 49 or 50)	1.51 (1.38-1.66)	0.000	1.43 (1.27-1.62)	0.000	1.64 (1.42-1.89)	0.000	1.63 (0.94-2.84)	0.082
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1.23 (1.03-1.48)	0.023	1.21 (0.95-1.54)	0.116	1.26 (0.96-1.67)	0.101	1.06 (0.70-1.62)	0.771
Vascular or Circulatory Disease (CC 104, 105)	1.07(0.94-1.22)	0.325	0.97 (0.81-1.16)	0.721	1.24 (1.01-1.52)	0.043	1.47 (1.04-2.08)	0.027
Metastatic Cancer and Acute Leukemia (CC 7, 8)	3.06 (2.56-3.64)	0.000	3.04 (2.41-3.84)	0.000	3.11 (2.37-4.08)	0.000	3.27 (2.09-5.10)	0.000
Trauma (CC 154 to 156, 158 to 162)	1.07 (0.93-1.22)	0.351	0.94 (0.78-1.12)	0.492	1.26 (1.03-1.54)	0.026	1.63 (1.12-2.38)	0.012
Major Psych Disorders (CC 54 to 56)	1.03 (0.84-1.28)	0.761	1.11 (0.85-1.46)	0.432	0.93 (0.65-1.32)	0.691	1.13 (0.76-1.67)	0.547
Liver and Biliary Disease (CC 25 to 27)	1.65 (1.22-2.23)	0.001	1.92 (1.31-2.82)	0.001	1.31 (0.80-2.15)	0.291	2.68 (1.94-3.69)	0.000

Table 9b. Odds Ratios for Risk Factors in HF Mortality Measure -- Stratified Results for FFS 65+ Patients, Non-FFS 65+ Patients, All 65+ Patients, and All 18-64 Patients

Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Risk Factor	All 65+ (N=44,424, C-statistic=0.690)		FFS 65+ (N=27,977, C-statistic=0.691)		Non-FFS 65+ (N= 16,447, C-statistic=0.694)		All 18-64 (N=15,598, C-Statistic=0.687)	
	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value
Intercept		0.0000		0.0000		0.0000		0.0000
Demographics								
Age	1.05 (1.04-1.05)	0.0000	1.05 (1.05-1.06)	0.0000	1.04 (1.04-1.05)	0.0000	1.02 (1.01-1.03)	0.0024
Male	1.32 (1.24-1.40)	0.0000	1.26 (1.17-1.37)	0.0000	1.39 (1.26-1.53)	0.0000	1.04 (0.88-1.23)	0.6533
Cardiovascular								
Percutaneous Transluminal Coronary Angioplasty	0.69 (0.62-0.78)	0.0000	0.67 (0.58-0.78)	0.0000	0.74 (0.62-0.90)	0.0023	0.96 (0.71-1.31)	0.8185
Coronary Artery Bypass Graft Surgery	0.92 (0.84-1.00)	0.0436	0.92 (0.82-1.02)	0.1071	0.93 (0.81-1.06)	0.2815	0.87 (0.66-1.16)	0.3408
Congestive Heart failure (CC 80)	1.26 (1.17-1.36)	0.0000	1.18 (1.07-1.29)	0.0006	1.43 (1.27-1.61)	0.0000	1.70 (1.38-2.09)	0.0000
Acute Myocardial Infarction (CC 81)	1.34 (1.20-1.49)	0.0000	1.43 (1.25-1.65)	0.0000	1.16 (0.99-1.38)	0.0739	1.35 (1.01-1.81)	0.0442
Unstable Angina (CC82)	0.80 (0.69-0.93)	0.0046	0.77 (0.63-0.94)	0.0119	0.84 (0.66-1.07)	0.1563	0.84 (0.58-1.22)	0.3553
Chronic atherosclerosis (CC 83, 84)	1.04 (0.97-1.11)	0.3230	1.04 (0.95-1.13)	0.4485	1.05 (0.93-1.18)	0.4192	1.01 (0.83-1.22)	0.9518
Cardio-respiratory failure and shock (CC 79)	1.03 (0.93-1.14)	0.5366	1.03 (0.91-1.17)	0.6248	1.06 (0.89-1.25)	0.5123	1.21 (0.96-1.54)	0.1124
Valvular or Rheumatic Heart Disease (CC 86)	1.15 (1.08-1.23)	0.0000	1.13 (1.05-1.23)	0.0023	1.18 (1.06-1.30)	0.0017	1.38 (1.15-1.66)	0.0005
Comorbidity								
Hypertension (CC 89, 91)	0.72 (0.67-0.76)	0.0000	0.73 (0.67-0.79)	0.0000	0.68 (0.62-0.76)	0.0000	0.64 (0.54-0.76)	0.0000
Stroke (CC 95, 96)	1.15 (0.96-1.38)	0.1249	1.26 (1.01-1.58)	0.0385	0.96 (0.69-1.32)	0.7871	1.23 (0.80-1.90)	0.3530
Renal Failure (CC 131)	1.11 (1.03-1.20)	0.0059	1.07 (0.97-1.18)	0.1768	1.16 (1.02-1.31)	0.0229	1.06 (0.86-1.31)	0.5594
Chronic Obstructive Pulmonary Disease (CC 108)	1.14 (1.07-1.21)	0.0000	1.18 (1.09-1.28)	0.0001	1.11 (1.00-1.23)	0.0524	1.09 (0.91-1.31)	0.3389
Pneumonia (CC 111 to 113)	1.33 (1.24-1.42)	0.0000	1.41 (1.30-1.54)	0.0000	1.20 (1.08-1.34)	0.0009	1.01 (0.83-1.22)	0.9522
Diabetes and DM Complications (CC 15 to 20, 120)	0.90 (0.84-0.96)	0.0010	0.90 (0.83-0.98)	0.0116	0.90 (0.81-1.00)	0.0445	1.03 (0.86-1.24)	0.7143
Protein-Calorie Malnutrition (CC 21)	1.91 (1.72-2.12)	0.0000	1.84 (1.62-2.10)	0.0000	2.03 (1.71-2.40)	0.0000	1.80 (1.35-2.41)	0.0001
Dementia and Senility (CC 49, 50)	1.52 (1.42-1.64)	0.0000	1.47 (1.35-1.62)	0.0000	1.65 (1.46-1.86)	0.0000	0.97 (0.59-1.62)	0.9201
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	0.94 (0.82-1.08)	0.3602	0.95 (0.80-1.13)	0.5482	0.92 (0.74-1.16)	0.4968	1.67 (1.27-2.21)	0.0003
Vascular or Circulatory Disease (CC 104, 105)	1.05 (0.96-1.15)	0.2817	1.03 (0.92-1.15)	0.6411	1.09 (0.94-1.25)	0.2589	1.17 (0.92-1.49)	0.1884
Metastatic Cancer and Acute Leukemia (CC 7, 8)	2.79 (2.42-3.21)	0.0000	2.80 (2.34-3.34)	0.0000	2.85 (2.26-3.59)	0.0000	3.96 (2.66-5.90)	0.0000
Trauma (CC 154 to 156, 158 to 162)	1.30 (1.19-1.43)	0.0000	1.30 (1.16-1.46)	0.0000	1.31 (1.12-1.53)	0.0006	1.12 (0.82-1.53)	0.4862
Major Psych Disorders (CC 54 to 56)	0.92 (0.78-1.07)	0.2718	0.99 (0.82-1.19)	0.9220	0.78 (0.58-1.05)	0.1007	0.96 (0.72-1.30)	0.8140
Liver and Biliary Disease (CC 25 to 27)	1.31 (1.09-1.58)	0.0042	1.24 (0.98-1.58)	0.0774	1.47 (1.10-1.98)	0.0096	1.71 (1.35-2.15)	0.0000

Table 9c. Odds Ratios for Risk Factors in HF Readmission Measure -- Stratified Results for FFS 65+ Patients, Non-FFS 65+ Patients, All 65+ Patients, and All 18-64 Patients

Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Risk Factor	All 65+ (N=54,773, C-statistic=0.617)		FFS 65+ (N=33,784, C-Statistic=0.619)		Non-FFS 65+ (N=20,989, C-Statistic=0.617)		All 18-64 (N=21,763, C-Statistic=0.689)	
	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value
Intercept		0.0000		0.0000		0.0000		0.0000
Demographics								
Age	1.00 (1.00-1.00)	0.8059	1.00 (1.00-1.00)	0.8997	1.00 (1.00-1.01)	0.8947	0.99 (0.99-1.00)	0.0007
Male	1.03 (0.99-1.08)	0.1615	1.01 (0.96-1.07)	0.7059	1.07 (1.00-1.15)	0.0627	1.02 (0.95-1.10)	0.5663
Cardiovascular								
Coronary Artery Bypass Graft Surgery	0.98 (0.93-1.03)	0.3807	0.96 (0.89-1.02)	0.2055	1.01 (0.92-1.10)	0.8365	0.94 (0.84-1.05)	0.2486
Congestive Heart failure (CC 80)	1.18 (1.11-1.24)	0.0000	1.19 (1.11-1.28)	0.0000	1.16 (1.06-1.27)	0.0013	1.31 (1.21-1.43)	0.0000
Acute coronary syndrome (CC 81, 82)	1.03 (0.97-1.10)	0.3025	0.99 (0.91-1.07)	0.8301	1.11 (1.00-1.22)	0.0468	1.09 (0.99-1.21)	0.0948
Arrhythmias (CC 92, 93)	1.05 (1.00-1.11)	0.0375	1.05 (0.98-1.12)	0.1507	1.06 (0.98-1.15)	0.1434	1.24 (1.14-1.35)	0.0000
Cardio-respiratory failure and shock (CC 79)	1.08 (1.01-1.16)	0.0218	1.04 (0.95-1.13)	0.3941	1.17 (1.04-1.30)	0.0075	1.13 (1.02-1.25)	0.0174
Valvular or Rheumatic Heart Disease (CC 86)	1.09 (1.04-1.13)	0.0003	1.08 (1.02-1.14)	0.0051	1.09 (1.01-1.17)	0.0196	1.06 (0.98-1.15)	0.1376
Vascular or Circulatory Disease (CC 104, 105, 106)	1.02 (0.97-1.08)	0.3845	1.04 (0.97-1.11)	0.2402	1.00 (0.91-1.09)	0.9450	1.18 (1.08-1.29)	0.0003
Chronic atherosclerosis (CC 83, 84)	1.11 (1.06-1.17)	0.0000	1.15 (1.08-1.22)	0.0000	1.04 (0.96-1.13)	0.3077	1.21 (1.12-1.31)	0.0000
Other and unspecified heart disease (CC 94)	1.02 (0.95-1.11)	0.5560	1.02 (0.93-1.13)	0.6405	1.02 (0.90-1.16)	0.7306	1.02 (0.91-1.14)	0.7295
Comorbidity								
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1.13 (1.03-1.23)	0.0072	1.16 (1.05-1.30)	0.0052	1.06 (0.91-1.22)	0.4667	0.95 (0.84-1.09)	0.4903
Stroke (CC 95, 96)	1.04 (0.92-1.18)	0.4979	1.00 (0.85-1.17)	0.9737	1.13 (0.92-1.40)	0.2455	1.04 (0.85-1.29)	0.6887
Renal Failure (CC 131)	1.16 (1.10-1.23)	0.0000	1.17 (1.09-1.25)	0.0000	1.14 (1.04-1.25)	0.0046	1.09 (0.99-1.20)	0.0668
Chronic Obstructive Pulmonary Disease (CC 108)	1.12 (1.07-1.17)	0.0000	1.11 (1.05-1.18)	0.0002	1.12 (1.04-1.20)	0.0034	1.19 (1.11-1.29)	0.0000
Diabetes and DM Complications (CC 15 to 20, 119, 120)	1.16 (1.11-1.21)	0.0000	1.13 (1.07-1.19)	0.0000	1.20 (1.11-1.29)	0.0000	1.07 (0.99-1.15)	0.0764
Disorders of fluid/electrolyte/acid-base (CC22, 23)	1.16 (1.10-1.22)	0.0000	1.14 (1.07-1.22)	0.0000	1.17 (1.07-1.27)	0.0005	1.30 (1.19-1.41)	0.0000
Other urinary tract disorders (CC 136)	1.17 (1.11-1.22)	0.0000	1.18 (1.11-1.26)	0.0000	1.14 (1.05-1.24)	0.0018	1.10 (1.01-1.19)	0.0305
Decubitus ulcer or chronic skin ulcer (CC 148, 149)	1.17 (1.08-1.26)	0.0002	1.18 (1.07-1.31)	0.0015	1.14 (1.00-1.30)	0.0489	1.02 (0.90-1.15)	0.7965
Other gastrointestinal disorders (CC 36)	1.06 (1.02-1.11)	0.0077	1.07 (1.01-1.13)	0.0182	1.05 (0.97-1.13)	0.2193	1.21 (1.13-1.31)	0.0000
Peptic ulcer, hemorrhage, other specified gastrointestinal disorders (CC 34)	1.02 (0.95-1.09)	0.6025	1.11 (1.01-1.20)	0.0214	0.88 (0.78-0.99)	0.0311	1.08 (0.96-1.22)	0.2189

Table 9c. Odds Ratios for Risk Factors in HF Readmission Measure -- Stratified Results for FFS 65+ Patients, Non-FFS 65+ Patients, All 65+ Patients, and All 18-64 Patients

Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Risk Factor	All 65+ (N=54,773, C-statistic=0.617)		FFS 65+ (N=33,784, C-Statistic=0.619)		Non-FFS 65+ (N=20,989, C-Statistic=0.617)		All 18-64 (N=21,763, C-Statistic=0.689)	
	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value	OR (95% CI)	P-value
Severe hematological disorders (CC 44)	1.25 (1.09-1.44)	0.0016	1.16 (0.98-1.39)	0.0868	1.44 (1.13-1.83)	0.0028	1.17 (0.93-1.48)	0.1849
Nephritis (CC132)	1.00 (0.91-1.09)	0.9597	0.98 (0.88-1.11)	0.7869	1.03 (0.91-1.18)	0.6085	0.97 (0.86-1.09)	0.5911
Dementia and Senility (CC 49, 50)	1.00 (0.94-1.06)	0.9592	1.00 (0.93-1.07)	0.9984	0.99 (0.90-1.10)	0.9089	0.78 (0.61-0.99)	0.0382
Metastatic Cancer and Acute Leukemia (CC 7)	1.15 (0.98-1.36)	0.0961	1.22 (1.00-1.50)	0.0541	1.03 (0.78-1.37)	0.8211	1.31 (0.93-1.84)	0.1287
Cancer (CC 8 to 12)	1.05 (0.98-1.13)	0.1617	1.00 (0.91-1.09)	0.9424	1.16 (1.03-1.30)	0.0141	0.95 (0.81-1.10)	0.4834
Liver and biliary disease (CC 25 to 30)	1.12 (1.03-1.21)	0.0064	1.07 (0.97-1.19)	0.1909	1.20 (1.06-1.37)	0.0058	1.22 (1.12-1.33)	0.0000
End-stage renal disease or dialysis (CC 129, 130)	1.40 (1.27-1.54)	0.0000	1.45 (1.28-1.63)	0.0000	1.32 (1.11-1.56)	0.0013	1.27 (1.12-1.44)	0.0001
Asthma (CC 110)	0.98 (0.90-1.07)	0.6641	0.97 (0.87-1.08)	0.5890	1.00 (0.86-1.16)	0.9926	1.07 (0.97-1.18)	0.1917
Iron deficiency and other/unspecified anemias and blood disease (CC 47)	1.15 (1.09-1.20)	0.0000	1.12 (1.06-1.19)	0.0001	1.18 (1.10-1.28)	0.0000	1.28 (1.19-1.38)	0.0000
Pneumonia (CC 111 to 113)	1.06 (1.01-1.11)	0.0226	1.05 (0.99-1.12)	0.0833	1.07 (0.98-1.15)	0.1142	1.07 (0.99-1.15)	0.1033
Drug/alcohol abuse/dependence/psychosis (CC 51 to 53)	1.05 (0.99-1.13)	0.1182	1.06 (0.97-1.15)	0.1944	1.05 (0.94-1.17)	0.4079	1.13 (1.05-1.22)	0.0010
Major pysch disorders (CC 54 to 56)	1.09 (0.98-1.21)	0.1173	1.13 (0.99-1.28)	0.0605	1.00 (0.83-1.21)	0.9722	1.48 (1.32-1.65)	0.0000
Depression (CC 58)	1.03 (0.97-1.10)	0.2727	1.06 (0.98-1.15)	0.1318	1.00 (0.90-1.10)	0.9662	1.08 (0.98-1.18)	0.1088
Other psychiatric disorders (CC 60)	1.14 (1.06-1.24)	0.0010	1.11 (1.00-1.23)	0.0407	1.19 (1.05-1.36)	0.0086	1.21 (1.08-1.35)	0.0006
Fibrosis of lung and other chronic lung disorders (CC 109)	1.14 (1.03-1.25)	0.0077	1.11 (0.99-1.25)	0.0802	1.18 (1.01-1.37)	0.0421	1.16 (0.95-1.40)	0.1399
Protein-Calorie Malnutrition (CC 21)	1.02 (0.93-1.12)	0.6763	1.04 (0.93-1.16)	0.4801	0.98 (0.84-1.15)	0.8365	1.14 (0.98-1.33)	0.1011

Table 10a. AMI Mortality Model with Interaction Terms -- GLM (N=39,481, C-Statistic=0.767)
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Risk Factor	Estimate	Standard Error	Wald Chi-Square	P-value	OR	LOR	UOR
Intercept	-6.047	0.173	1221.388	0.0000			
Demographics							
Age	0.053	0.002	529.957	0.0000	1.05	1.05	1.06
Male	0.067	0.093	0.521	0.4704	1.07	0.89	1.28
Cardiovascular							
Percutaneous Transluminal Coronary Angioplasty	-0.155	0.145	1.135	0.2868	0.86	0.64	1.14
Coronary Artery Bypass Graft Surgery	0.123	0.178	0.477	0.4899	1.13	0.80	1.60
Congestive Heart failure (CC 80)	0.226	0.163	1.906	0.1674	1.25	0.91	1.73
Acute Myocardial Infarction (CC 81)	0.328	0.195	2.817	0.0933	1.39	0.95	2.04
Unstable Angina (CC82)	-0.445	0.250	3.170	0.0750	0.64	0.39	1.05
Anterior Myocardial Infarction (ICD9 410.00-410.19)	0.686	0.106	41.646	0.0000	1.99	1.61	2.44
Other Location of Myocardial Infarction (ICD9 410.20-410.69)	0.263	0.106	6.107	0.0135	1.30	1.06	1.60
Chronic atherosclerosis (CC 83 or 84)	-0.834	0.090	86.492	0.0000	0.43	0.36	0.52
Cardio-respiratory failure and shock (CC 79)	-0.086	0.213	0.162	0.6873	0.92	0.60	1.39
Valvular or Rheumatic Heart Disease (CC 86)	0.574	0.128	20.239	0.0000	1.78	1.38	2.28
Comorbidity							
Hypertension (CC 89, 91)	-0.360	0.084	18.156	0.0000	0.70	0.59	0.82
Stroke (CC 95 or 96)	-0.092	0.363	0.064	0.8007	0.91	0.45	1.86
Cerebrovascular Disease (CC 97 to 99, 103)	0.097	0.243	0.160	0.6894	1.10	0.68	1.77
Renal Failure (CC 131)	0.535	0.165	10.574	0.0011	1.71	1.24	2.36
Chronic Obstructive Pulmonary Disease (CC 108)	0.125	0.114	1.187	0.2759	1.13	0.91	1.42
Pneumonia (CC 111 to 113)	0.731	0.126	33.862	0.0000	2.08	1.62	2.66
Diabetes and DM Complications (CC 15 to 20, 120)	0.538	0.089	36.653	0.0000	1.71	1.44	2.04
Protein-Calorie Malnutrition (CC 21)	0.725	0.224	10.449	0.0012	2.06	1.33	3.20
Dementia and Senility (CC 49 or 50)	0.479	0.283	2.863	0.0907	1.61	0.93	2.81
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	0.065	0.215	0.090	0.7642	1.07	0.70	1.63
Vascular or Circulatory Disease (CC 104, 105)	0.377	0.176	4.598	0.0320	1.46	1.03	2.06
Metastatic Cancer and Acute Leukemia (CC 7, 8)	1.140	0.227	25.247	0.0000	3.13	2.00	4.88
Trauma (CC 154 to 156, 158 to 162)	0.496	0.194	6.552	0.0105	1.64	1.12	2.40
Major Psych Disorders (CC 54 to 56)	0.137	0.202	0.459	0.4979	1.15	0.77	1.70
Liver and Biliary Disease (CC 25 to 27)	1.007	0.164	37.763	0.0000	2.74	1.99	3.78
Older (Age>=65)	0.105	0.143	0.543	0.4611	1.11	0.84	1.47

Interactions

Table 10a. AMI Mortality Model with Interaction Terms -- GLM (N=39,481, C-Statistic=0.767)
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Risk Factor	Estimate	Standard Error	Wald Chi-Square	P-value	OR	LOR	UOR
Older and Male	0.076	0.100	0.577	0.4474	1.08	0.89	1.31
Cardiovascular							
Older and Percutaneous Transluminal Coronary Angioplasty	-0.074	0.160	0.213	0.6441	0.93	0.68	1.27
Older and Coronary Artery Bypass Graft Surgery	0.021	0.188	0.012	0.9129	1.02	0.71	1.47
Older and Congestive Heart failure (CC 80)	0.234	0.173	1.821	0.1772	1.26	0.90	1.77
Older and Acute Myocardial Infarction (CC 81)	-0.286	0.210	1.860	0.1726	0.75	0.50	1.13
Older and Unstable Angina (CC82)	0.213	0.270	0.623	0.4298	1.24	0.73	2.10
Older and Anterior Myocardial Infarction (ICD9 410.00-410.19)	-0.150	0.119	1.599	0.2061	0.86	0.68	1.09
Older and Other Location of Myocardial Infarction (ICD9 410.20-410.69)	0.139	0.118	1.372	0.2415	1.15	0.91	1.45
Older and Chronic atherosclerosis (CC 83 or 84)	0.323	0.099	10.642	0.0011	1.38	1.14	1.68
Older and Cardio-respiratory failure and shock (CC 79)	-0.071	0.234	0.093	0.7601	0.93	0.59	1.47
Older and Valvular or Rheumatic Heart Disease (CC 86)	-0.452	0.135	11.206	0.0008	0.64	0.49	0.83
Comorbidity							
Older and Hypertension (CC 89, 91)	0.011	0.092	0.014	0.9068	1.01	0.84	1.21
Older and Stroke (CC 95 or 96)	0.363	0.382	0.904	0.3416	1.44	0.68	3.04
Older and Cerebrovascular Disease (CC 97 to 99, 103)	0.144	0.253	0.323	0.5696	1.15	0.70	1.90
Older and 'Renal Failure (CC 131)	-0.433	0.176	6.049	0.0139	0.65	0.46	0.92
Older and Chronic Obstructive Pulmonary Disease (CC 108)	-0.032	0.123	0.068	0.7936	0.97	0.76	1.23
Older and Pneumonia (CC 111 to 113)	-0.304	0.134	5.149	0.0233	0.74	0.57	0.96
Older and Diabetes and DM Complications (CC 15 to 20, 120)	-0.372	0.097	14.681	0.0001	0.69	0.57	0.83
Older and Protein-Calorie Malnutrition (CC 21)	-0.295	0.239	1.528	0.2165	0.74	0.47	1.19
Older and Dementia and Senility (CC 49 or 50)	-0.055	0.287	0.037	0.8472	0.95	0.54	1.66
Older and Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	0.141	0.234	0.363	0.5471	1.15	0.73	1.82
Older and Vascular or Circulatory Disease (CC 104, 105)	-0.311	0.189	2.711	0.0997	0.73	0.51	1.06
Older and Metastatic Cancer and Acute Leukemia (CC 7, 8)	-0.028	0.244	0.013	0.9093	0.97	0.60	1.57
Older and Trauma (CC 154 to 156, 158 to 162)	-0.428	0.205	4.342	0.0372	0.65	0.44	0.97
Older and Major Psych Disorders (CC 54 to 56)	-0.108	0.229	0.222	0.6376	0.90	0.57	1.41
Older and Liver and Biliary Disease (CC 25 to 27)	-0.516	0.225	5.278	0.0216	0.60	0.38	0.93

Table 10b. HF Mortality Model with Interaction Terms -- GLM (N=60,022, C-statistic= 0.720)
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Risk Factor	Estimate	Standard Error	Wald Chi-Square	P-value	OR	LOR	UOR
Intercept	-5.9558	0.1520	1534.4593	0.0000			
Demographics							
Age	0.0435	0.0020	480.4268	0.0000	1.0445	1.0404	1.0485
Male	0.0601	0.0869	0.4792	0.4888	1.0620	0.8957	1.2591
Cardiovascular							
Percutaneous Transluminal Coronary Angioplasty	-0.0488	0.1568	0.0970	0.7554	0.9523	0.7003	1.2950
Coronary Artery Bypass Graft Surgery	-0.1931	0.1445	1.7846	0.1816	0.8244	0.6211	1.0944
Congestive Heart failure (CC 80)	0.5665	0.1063	28.3788	0.0000	1.7621	1.4306	2.1704
Acute Myocardial Infarction (CC 81)	0.3000	0.1501	3.9979	0.0456	1.3499	1.0059	1.8114
Unstable Angina (CC82)	-0.1612	0.1902	0.7188	0.3965	0.8511	0.5863	1.2355
Chronic atherosclerosis (CC 83, 84)	-0.0734	0.0992	0.5473	0.4594	0.9292	0.7650	1.1287
Cardio-respiratory failure and shock (CC 79)	0.2067	0.1222	2.8626	0.0907	1.2297	0.9678	1.5624
Valvular or Rheumatic Heart Disease (CC 86)	0.3309	0.0936	12.5054	0.0004	1.3922	1.1589	1.6724
Comorbidity							
Hypertension (CC 89, 91)	-0.4502	0.0881	26.1116	0.0000	0.6375	0.5364	0.7576
Stroke (CC 95, 96)	0.2355	0.2226	1.1196	0.2900	1.2655	0.8181	1.9576
Renal Failure (CC 131)	0.0505	0.1064	0.2249	0.6353	1.0518	0.8538	1.2957
Chronic Obstructive Pulmonary Disease (CC 108)	0.0319	0.0916	0.1214	0.7275	1.0324	0.8628	1.2354
Pneumonia (CC 111 to 113)	0.0122	0.0995	0.0151	0.9023	1.0123	0.8330	1.2302
Diabetes and DM Complications (CC 15 to 20, 120)	-0.0300	0.0915	0.1077	0.7428	0.9704	0.8110	1.1611
Protein-Calorie Malnutrition (CC 21)	0.5761	0.1478	15.1888	0.0001	1.7791	1.3316	2.3769
Dementia and Senility (CC 49, 50)	-0.0752	0.2597	0.0840	0.7720	0.9275	0.5576	1.5429
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	0.5119	0.1413	13.1290	0.0003	1.6685	1.2649	2.2008
Vascular or Circulatory Disease (CC 104, 105)	0.1623	0.1219	1.7733	0.1830	1.1762	0.9263	1.4936
Metastatic Cancer and Acute Leukemia (CC 7, 8)	1.3165	0.2035	41.8623	0.0000	3.7303	2.5035	5.5583
Trauma (CC 154 to 156, 158 to 162)	0.1049	0.1593	0.4332	0.5104	1.1106	0.8127	1.5176
Major Psych Disorders (CC 54 to 56)	-0.0053	0.1526	0.0012	0.9722	0.9947	0.7375	1.3415
Liver and Biliary Disease (CC 25 to 27)	0.5438	0.1185	21.0493	0.0000	1.7225	1.3654	2.1729
Old (Age>=65)	-0.0298	0.1316	0.0513	0.8208	0.9706	0.7499	1.2563
Interactions							
Male	0.2092	0.0924	5.1235	0.0236	1.2326	1.0284	1.4774
Cardiovascular							
Percutaneous Transluminal Coronary Angioplasty	-0.3218	0.1677	3.6799	0.0551	0.7249	0.5218	1.0070
Coronary Artery Bypass Graft Surgery	0.1028	0.1508	0.4646	0.4955	1.1082	0.8247	1.4892
Congestive Heart failure (CC 80)	-0.3318	0.1128	8.6452	0.0033	0.7176	0.5752	0.8953

Table 10b. HF Mortality Model with Interaction Terms -- GLM (N=60,022, C-statistic= 0.720)
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Risk Factor	Estimate	Standard Error	Wald Chi-Square	P-value	OR	LOR	UOR
Acute Myocardial Infarction (CC 81)	-0.0077	0.1596	0.0023	0.9615	0.9923	0.7257	1.3568
Unstable Angina (CC82)	-0.0629	0.2056	0.0934	0.7599	0.9391	0.6276	1.4052
Chronic atherosclerosis (CC 83, 84)	0.1093	0.1055	1.0734	0.3002	1.1155	0.9071	1.3718
Cardio-respiratory failure and shock (CC 79)	-0.1801	0.1328	1.8397	0.1750	0.8352	0.6438	1.0835
Valvular or Rheumatic Heart Disease (CC 86)	-0.1870	0.0990	3.5715	0.0588	0.8294	0.6832	1.0070
Comorbidity							
Hypertension (CC 89, 91)	0.1163	0.0938	1.5380	0.2149	1.1233	0.9347	1.3499
Stroke (CC 95, 96)	-0.0937	0.2412	0.1509	0.6977	0.9106	0.5676	1.4608
Renal Failure (CC 131)	0.0558	0.1135	0.2416	0.6230	1.0574	0.8465	1.3208
Chronic Obstructive Pulmonary Disease (CC 108)	0.0948	0.0972	0.9531	0.3289	1.0995	0.9089	1.3301
Pneumonia (CC 111 to 113)	0.2758	0.1050	6.8964	0.0086	1.3176	1.0725	1.6188
Diabetes and DM Complications (CC 15 to 20, 120)	-0.0927	0.0976	0.9018	0.3423	0.9115	0.7528	1.1036
Protein-Calorie Malnutrition (CC 21)	0.0707	0.1570	0.2028	0.6525	1.0733	0.7890	1.4599
Dementia and Senility (CC 49, 50)	0.5109	0.2622	3.7963	0.0514	1.6668	0.9970	2.7865
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	-0.5810	0.1574	13.6173	0.0002	0.5594	0.4109	0.7616
Vascular or Circulatory Disease (CC 104, 105)	-0.1159	0.1300	0.7942	0.3728	0.8906	0.6902	1.1491
Metastatic Cancer and Acute Leukemia (CC 7, 8)	-0.2986	0.2158	1.9160	0.1663	0.7418	0.4860	1.1323
Trauma (CC 154 to 156, 158 to 162)	0.1628	0.1662	0.9596	0.3273	1.1768	0.8497	1.6298
Major Psych Disorders (CC 54 to 56)	-0.0924	0.1725	0.2869	0.5922	0.9117	0.6502	1.2785
Liver and Biliary Disease (CC 25 to 27)	-0.2872	0.1518	3.5810	0.0584	0.7504	0.5573	1.0103

Table 10c. HF Readmission Model with Interaction Terms -- GLM (N=76,536, C-statistic= 0.640)
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Risk Factor	Estimate	Standard Error	Wald Chi-Square	P-value	OR	LOR	UOR
Intercept	-2.029	0.075	727.902	0.000			
Demographics							
Age	-0.002	0.001	3.039	0.081	0.998	0.996	1.000
Male	0.024	0.036	0.449	0.503	1.024	0.955	1.099
Cardiovascular							
Coronary Artery Bypass Graft Surgery	-0.077	0.057	1.849	0.174	0.926	0.828	1.035
Congestive Heart failure (CC 80)	0.281	0.044	41.753	0.000	1.325	1.216	1.443
Acute coronary syndrome (CC 81, 82)	0.087	0.052	2.801	0.094	1.091	0.985	1.208
Arrhythmias (CC 92, 93)	0.210	0.042	25.509	0.000	1.234	1.137	1.338
Cardio-respiratory failure and shock (CC 79)	0.122	0.051	5.808	0.016	1.130	1.023	1.248
Valvular or Rheumatic Heart Disease (CC 86)	0.060	0.040	2.235	0.135	1.062	0.981	1.149
Vascular or Circulatory Disease (CC 104, 105, 106)	0.163	0.045	12.966	0.000	1.177	1.077	1.286
Chronic atherosclerosis (CC 83, 84)	0.173	0.039	20.197	0.000	1.189	1.103	1.283
Other and unspecified heart disease (CC 94)	0.024	0.058	0.174	0.676	1.024	0.915	1.147
Comorbidity							
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	-0.049	0.067	0.531	0.466	0.953	0.836	1.086
Stroke (CC 95, 96)	0.048	0.107	0.202	0.653	1.049	0.851	1.293
Renal Failure (CC 131)	0.084	0.048	3.065	0.080	1.088	0.990	1.196
Chronic Obstructive Pulmonary Disease (CC 108)	0.161	0.038	18.062	0.000	1.175	1.091	1.265
Diabetes and DM Complications (CC 15 to 20, 119, 120)	0.053	0.037	2.095	0.148	1.055	0.981	1.134
Disorders of fluid/electrolyte/acid-base (CC22, 23)	0.265	0.042	38.953	0.000	1.304	1.199	1.417
Other urinary tract disorders (CC 136)	0.093	0.042	4.810	0.028	1.097	1.010	1.193
Decubitus ulcer or chronic skin ulcer (CC 148, 149)	0.013	0.062	0.046	0.830	1.013	0.897	1.145
Other gastrointestinal disorders (CC 36)	0.193	0.038	25.226	0.000	1.213	1.125	1.307
Peptic ulcer, hemorrhage, other specified gastrointestinal disorders (CC 34)	0.073	0.062	1.376	0.241	1.075	0.952	1.214
Severe hematological disorders (CC 44)	0.157	0.119	1.741	0.187	1.169	0.927	1.476
Nephritis (CC132)	-0.026	0.059	0.200	0.655	0.974	0.867	1.094
Dementia and Senility (CC 49, 50)	-0.268	0.121	4.885	0.027	0.765	0.603	0.970
Metastatic Cancer and Acute Leukemia (CC 7)	0.264	0.176	2.264	0.132	1.303	0.923	1.838
Cancer (CC 8 to 12)	-0.069	0.078	0.786	0.375	0.933	0.800	1.088
Liver and biliary disease (CC 25 to 30)	0.197	0.044	19.762	0.000	1.218	1.117	1.329
End-stage renal disease or dialysis (CC 129, 130)	0.251	0.063	16.009	0.000	1.286	1.137	1.454
Asthma (CC 110)	0.080	0.050	2.532	0.112	1.083	0.982	1.196
Iron deficiency and other/unspecified anemias and blood disease (CC 47)	0.244	0.039	39.542	0.000	1.277	1.183	1.378
Pneumonia (CC 111 to 113)	0.066	0.040	2.781	0.095	1.068	0.988	1.155

Table 10c. HF Readmission Model with Interaction Terms -- GLM (N=76,536, C-statistic= 0.640)
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Risk Factor	Estimate	Standard Error	Wald Chi-Square	P-value	OR	LOR	UOR
Drug/alcohol abuse/dependence/psychosis (CC 51 to 53)	0.137	0.037	13.797	0.000	1.147	1.067	1.234
Major pysch disorders (CC 54 to 56)	0.392	0.058	45.414	0.000	1.479	1.320	1.658
Depression (CC 58)	0.074	0.046	2.622	0.105	1.077	0.984	1.179
Other psychiatric disorders (CC 60)	0.194	0.056	12.155	0.000	1.214	1.089	1.354
Fibrosis of lung and other chronic lung disorders (CC 109)	0.145	0.099	2.175	0.140	1.157	0.953	1.403
Protein-Calorie Malnutrition (CC 21)	0.126	0.078	2.602	0.107	1.135	0.973	1.323
Old (Age>=65)	0.321	0.063	25.644	0.000	1.379	1.218	1.562
Interactions							
Old and Male	0.003	0.042	0.006	0.937	1.003	0.924	1.090
Cardiovascular							
Old and Coronary Artery Bypass Graft Surgery	0.051	0.063	0.664	0.415	1.053	0.930	1.191
Old and Congestive Heart failure (CC 80)	-0.118	0.052	5.175	0.023	0.889	0.803	0.984
Old and Acute coronary syndrome (CC 81, 82)	-0.055	0.061	0.806	0.369	0.947	0.840	1.067
Old and Arrhythmias (CC 92, 93)	-0.155	0.049	10.071	0.002	0.857	0.779	0.943
Old and Cardio-respiratory failure and shock (CC 79)	-0.046	0.061	0.573	0.449	0.955	0.847	1.076
Old and Valvular or Rheumatic Heart Disease (CC 86)	0.024	0.046	0.268	0.605	1.024	0.936	1.121
Old and Vascular or Circulatory Disease (CC 104, 105, 106)	-0.140	0.053	6.971	0.008	0.870	0.784	0.965
Old and Chronic atherosclerosis (CC 83, 84)	-0.069	0.046	2.243	0.134	0.933	0.853	1.022
Old and Other and unspecified heart disease (CC 94)	-0.002	0.070	0.001	0.982	0.998	0.871	1.145
Comorbidity							
Old and Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	0.164	0.080	4.208	0.040	1.178	1.007	1.378
Old and Stroke (CC 95, 96)	-0.005	0.124	0.001	0.970	0.995	0.780	1.270
Old and Renal Failure (CC 131)	0.063	0.056	1.253	0.263	1.065	0.954	1.188
Old and Chronic Obstructive Pulmonary Disease (CC 108)	-0.053	0.044	1.426	0.232	0.949	0.870	1.034
Old and Diabetes and DM Complications (CC 15 to 20, 119, 120)	0.083	0.043	3.642	0.056	1.086	0.998	1.183
Old and Disorders of fluid/electrolyte/acid-base (CC22, 23)	-0.121	0.050	5.879	0.015	0.886	0.804	0.977
Old and Other urinary tract disorders (CC 136)	0.062	0.049	1.587	0.208	1.064	0.966	1.172
Old and Decubitus ulcer or chronic skin ulcer (CC 148, 149)	0.139	0.075	3.481	0.062	1.149	0.993	1.331
Old and Other gastrointestinal disorders (CC 36)	-0.130	0.045	8.441	0.004	0.878	0.804	0.959
Old and Peptic ulcer, hemorrhage, other specified gastrointestinal disorders (CC 34)	-0.055	0.071	0.590	0.442	0.947	0.823	1.089
Old and Severe hematological disorders (CC 44)	0.070	0.139	0.253	0.615	1.072	0.817	1.407
Old and Nephritis (CC132)	0.019	0.074	0.067	0.795	1.019	0.882	1.178
Old and Dementia and Senility (CC 49, 50)	0.280	0.125	5.048	0.025	1.324	1.036	1.691

Table 10c. HF Readmission Model with Interaction Terms -- GLM (N=76,536, C-statistic= 0.640)
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Risk Factor	Estimate	Standard Error	Wald Chi-Square	P-value	OR	LOR	UOR
Old and 'Metastatic Cancer and Acute Leukemia (CC 7)	-0.127	0.195	0.423	0.515	0.881	0.601	1.291
Old and Cancer (CC 8 to 12)	0.121	0.087	1.953	0.162	1.129	0.952	1.338
Old and Liver and biliary disease (CC 25 to 30)	-0.089	0.061	2.142	0.143	0.915	0.812	1.031
Old and End-stage renal disease or dialysis (CC 129, 130)	0.078	0.080	0.935	0.334	1.081	0.923	1.265
Old and Asthma (CC 110)	-0.102	0.068	2.292	0.130	0.903	0.790	1.031
Old and Iron deficiency and other/unspecified anemias and blood disease (CC 47)	-0.107	0.045	5.553	0.018	0.899	0.822	0.982
Old and 'Pneumonia (CC 111 to 113)	-0.008	0.047	0.033	0.855	0.992	0.905	1.086
Old and Drug/alcohol abuse/dependence/psychosis (CC 51 to 53)	-0.095	0.050	3.678	0.055	0.909	0.825	1.002
Old and Major pysch disorders (CC 54 to 56)	-0.312	0.079	15.554	0.000	0.732	0.627	0.855
Old and Depression (CC 58)	-0.042	0.056	0.578	0.447	0.959	0.860	1.069
Old and Other psychiatric disorders (CC 60)	-0.062	0.069	0.807	0.369	0.940	0.821	1.076
Old and Fibrosis of lung and other chronic lung disorders (CC 109)	-0.017	0.110	0.024	0.878	0.983	0.793	1.219
Old and Protein-Calorie Malnutrition (CC 21)	-0.105	0.091	1.335	0.248	0.900	0.754	1.076

Table 11a. AMI Mortality Model Performance for Models with Interaction Terms by Patient Subgroups
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Model with	N	C-statistic	SE	Lower C-stat	Upper C-stat	Predictive Ability*
All 65+	24,561	0.714	0.004	0.705	0.722	(NA, 35.17%)
FFS, 65+	13,347	0.712	0.006	0.700	0.723	(NA, 35.12%)
Non-FFS, 65+	11,214	0.715	0.007	0.702	0.728	(NA, 35.24%)
All 18-64	14,920	0.750	0.010	0.730	0.769	(1.06%, 26.98%)
All 18+	**39,481**	**0.767**	**0.004**	**0.760**	**0.774**	**(1.06%, 34.78%)**

* Mean observed mortality in the lowest and the highest decile of the predicted mortality.

Table 11b. HF Mortality Model Performance for Models with Interaction by Patient Subgroups
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Model with	N	C-statistic	SE	Lower C-stat	Upper C-stat	Predictive Ability*
All 65+	44,424	0.691	0.004	0.683	0.698	(1.45%, 25.62%)
FFS, 65+	27,977	0.691	0.005	0.681	0.700	(0.00%, 24.63%)
Non-FFS, 65+	16,447	0.692	0.006	0.680	0.704	(3.33%, 27.58%)
All 18-64	15,598	0.681	0.011	0.659	0.703	(1.87%, 17.78%)
All 18+	**60,022**	**0.720**	**0.003**	**0.714**	**0.727**	**(1.87%, 25.44%)**

*Mean observation mortality in the lowest and the highest decile of the predicted mortality.

Table 11c. HF Readmission Model Performance for Models with Interaction by Patient Subgroups
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Model with	N	C-statistic	SE	Lower C-stat	Upper C-stat	Predictive Ability*
All 65+	54,773	0.617	0.003	0.612	0.623	(12.13%, 40.51%)
FFS, 65+	33,784	0.618	0.004	0.611	0.625	(12.58%, 40.66%)
Non-FFS, 65+	20,989	0.615	0.005	0.606	0.624	(11.53%, 40.21%)
All 18-64	21,763	0.689	0.004	0.680	0.697	(11.93%, 47.25%)
All 18+	**76,536**	**0.640**	**0.002**	**0.636**	**0.645**	**(11.99%, 44.07%)**

*Mean observation readmission in the lowest and the highest decile of the predicted readmission.

Table 12a. Reclassification Table of Risk Categories for AMI Mortality Model with and without Interaction Terms
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Model without Interactions	Model with Interactions										
	0 to <5%		5% to <10%		10% to <20%		>=20%		Total		
	#	%	#	%	#	%	#	%	#	%	
Among All 18+ Patients											
Risk Category											
0 to <5%	11,400	28.9	697	1.8	9	0.0	0	0.0	12,106	30.7	
5% to <10%	930	2.4	8,797	22.3	1,024	2.6	11	0.0	10,762	27.3	
10% to <20%	0	0.0	223	0.6	9,195	23.3	417	1.1	9,835	24.9	Same category: 90.84
>=20%	0	0.0	0	0.0	303	0.8	6,475	16.4	6,778	17.2	Similar category: 99.95
Total	12,330	31.2	9,717	24.6	10,531	26.7	6,903	17.5	39,481	100.0	
In All 65+ Patients											
Risk Category											
0 to <5%	1,156	4.7	277	1.1	0	0.0	0	0.0	1,433	5.8	
5% to <10%	17	0.1	6,678	27.2	590	2.4	0	0.0	7,285	29.7	
10% to <20%	0	0.0	164	0.7	8,791	35.8	239	1.0	9,194	37.4	Same category: 93.54
>=20%	0	0.0	0	0.0	300	1.2	6,349	25.9	6,649	27.1	Similar category: 100.00
Total	1,173	4.8	7,119	29.0	9,681	39.4	6,588	26.8	24,561	100.0	
In FFS 65+ Patients											
Risk Category											
0 to <5%	573	4.3	137	1.0	0	0.0	0	0.0	710	5.3	
5% to <10%	10	0.1	3,408	25.5	314	2.4	0	0.0	3,732	28.0	
10% to <20%	0	0.0	87	0.7	4,761	35.7	140	1.1	4,988	37.4	Same category: 93.55
>=20%	0	0.0	0	0.0	172	1.3	3,745	28.1	3,917	29.4	Similar category: 99.99
Total	583	4.4	3,632	27.2	5,247	39.3	3,885	29.1	13,347	100.0	
InNon-FFS 65+ Patients											
Risk Category											
0 to <5%	583	5.2	140	1.3	0	0.0	0	0.0	723	6.5	
5% to <10%	7	0.1	3,270	29.2	276	2.5	0	0.0	3,553	31.7	
10% to <20%	0	0.0	77	0.7	4,030	35.9	99	0.9	4,206	37.5	Same category: 93.52
>=20%	0	0.0	0	0.0	128	1.1	2,604	23.2	2,732	24.4	Similar category: 100.00
Total	590	5.3	3,487	31.1	4,434	39.5	2,703	24.1	11,214	100.0	
In All 18-64 Patients											
Risk Category											
0 to <5%	10,244	68.7	420	2.8	9	0.1	0	0.0	10,673	71.5	
5% to <10%	913	6.1	2,119	14.2	434	2.9	11	0.1	3,477	23.3	
10% to <20%	0	0.0	59	0.4	404	2.7	178	1.2	641	4.3	Same category: 86.41
>=20%	0	0.0	0	0.0	3	0.0	126	0.8	129	0.9	Similar category: 99.87
Total	11,157	74.8	2,598	17.4	850	5.7	315	2.1	14,920	100.0	

Table 12b. Reclassification Table of Risk Categories for HF Mortality Model with and without Interaction Terms
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Model without Interaction	Model With Interaction										
	0 to <5%		5% to <10%		10% to <20%		>=20%		Total		
	#	%	#	%	#	%	#	%	#	%	
Among All 18+ Patients											
Risk Category											
0 to <5%	16,018	26.69	1,053	1.75	17	0.03	0	0.00	17,088	28.5	
5% to <10%	892	1.49	19,056	31.75	752	1.25	6	0.01	20,706	34.5	
10% to <20%	3	0.00	629	1.05	16,345	27.23	301	0.50	17,278	28.8	Same category: 93.5
>=20%	0	0.00	0	0.00	239	0.40	4,711	7.85	4,950	8.3	Similar category: 100.0
Total	16,913	28.18	20,738	34.55	17,353	28.91	5,018	8.36	60,022	100.0	
In All 65+ Patients											
Risk Category											
0 to <5%	4,422	9.95	126	0.28	0	0.00	0	0.00	4,548	10.2	
5% to <10%	346	0.78	17,404	39.18	395	0.89	0	0.00	18,145	40.9	
10% to <20%	0	0.00	539	1.21	16,056	36.14	233	0.52	16,828	37.9	Same category: 95.8
>=20%	0	0.00	0	0.00	226	0.51	4,677	10.53	4,903	11.0	Similar category: 100.0
Total	4,768	10.73	18,069	40.67	16,677	37.54	4,910	11.05	44,424	100.0	
In FFS 65+ Patients											
Risk Category											
0 to <5%	2,707	9.68	71	0.25	0	0.00	0	0.00	2,778	9.9	
5% to <10%	216	0.77	10,685	38.19	222	0.79	0	0.00	11,123	39.8	
10% to <20%	0	0.00	344	1.23	10,315	36.87	155	0.55	10,814	38.7	Same category: 95.9
>=20%	0	0.00	0	0.00	153	0.55	3,109	11.11	3,262	11.7	Similar category: 100.0
Total	2,923	10.45	11,100	39.67	10,690	38.21	3,264	11.66	27,977	100.0	
In Non-FFS 65+ Patients											
Risk Category											
0 to <5%	1,715	10.43	55	0.33	0	0.00	0	0.00	1,770	10.8	
5% to <10%	130	0.79	6,719	40.85	173	1.05	0	0.00	7,022	42.7	
10% to <20%	0	0.00	195	1.19	5,741	34.91	78	0.47	6,014	36.6	Same category: 95.7
>=20%	0	0.00	0	0.00	73	0.44	1,568	9.53	1,641	10.0	Similar category: 100.0
Total	1,845	11.22	6,969	42.37	5,987	36.40	1,646	10.00	16,447	100.0	
In All 18-64 Patients											
Risk Category											
0 to <5%	11,596	74.34	927	5.94	17	0.11	0	0.00	12,540	80.4	
5% to <10%	546	3.50	1,652	10.59	357	2.29	6	0.04	2,561	16.4	
10% to <20%	3	0.02	90	0.58	289	1.85	68	0.44	450	2.9	Same category: 87.0
>=20%	0	0.00	0	0.00	13	0.08	34	0.22	47	0.3	Similar category: 99.8
Total	12,145	77.86	2,669	17.11	676	4.33	108	0.70	15,598	100.0	

Table 12c. Reclassification Table of Risk Categories for HF Readmission Model with and without Interaction Terms
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals
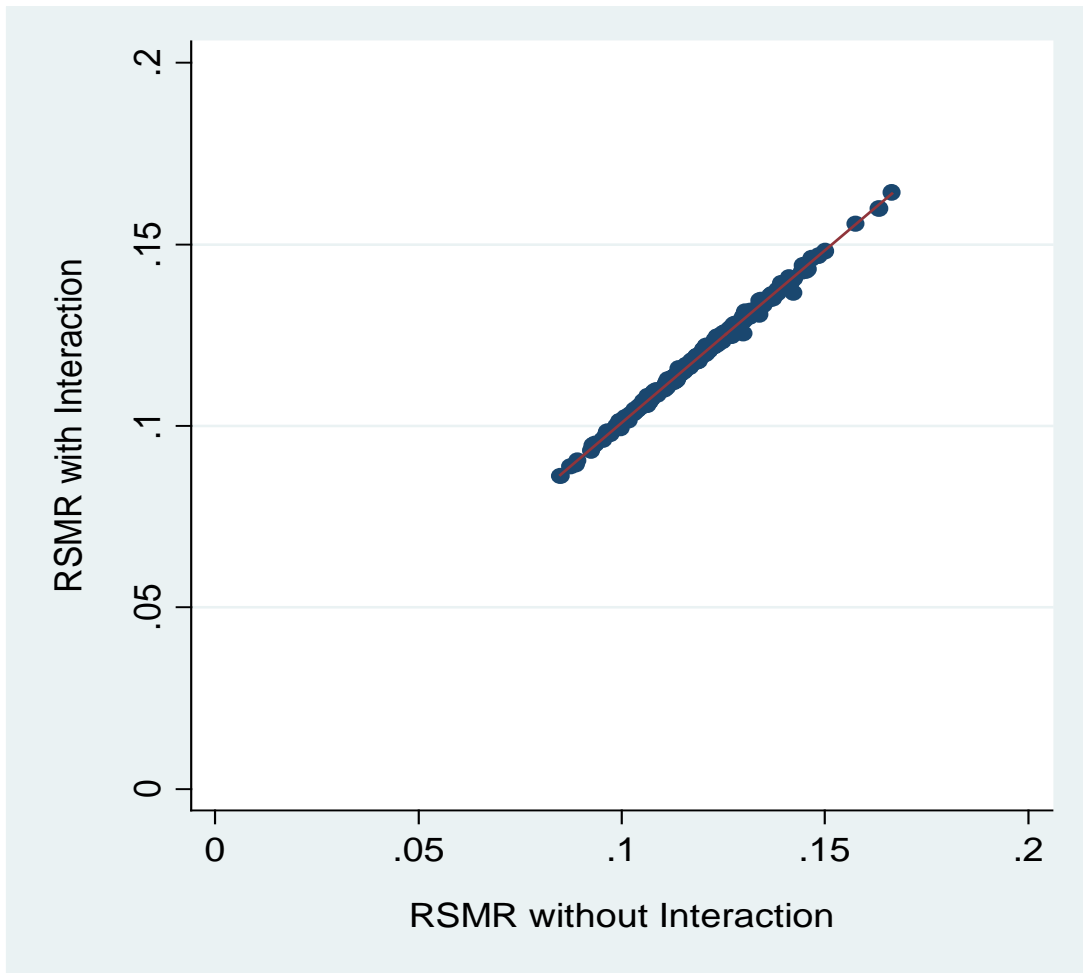
Model without Interaction	Model With Interaction											
	0 to <15%		15% to <20%		20% to <25%		25% to <30%		>=30%		Total	
	#	%	#	%	#	%	#	%	#	%	#	%
Among All 18+ Patients												
Risk Category												
0 to <15%	8,836	11.54	3,793	4.96	0	0.00	0	0.00	0	0.00	12,629	16.5
15% to <20%	3,236	4.23	17,751	23.19	1,669	2.18	0	0.00	0	0.00	22,656	29.6
20% to <25%	5	0.01	1,576	2.06	11,226	14.67	1,080	1.41	13	0.02	13,900	18.2	Same category: 79.0
25% to <30%	0	0.00	14	0.02	1,672	2.18	7,731	10.10	1,140	1.49	10,557	13.8	Similar category: 99.9
>=30%	0	0.00	0	0.00	21	0.03	1,848	2.41	14,925	19.50	16,794	21.9
Total	12,077	15.78	23,134	30.23	14,588	19.06	10,659	13.92	16,078	21.01	76,536	100.0
In All 65+ Patients												
Risk Category												
0 to <15%	5,451	9.95	3,793	6.92	0	0.00	0	0.00	0	0.00	9,244	16.9
15% to <20%	32	0.06	14,703	26.84	1,548	2.83	0	0.00	0	0.00	16,283	29.7
20% to <25%	0	0.00	568	1.04	9,102	16.62	621	1.13	0	0.00	10,291	18.8	Same category: 82.3
25% to <30%	0	0.00	0	0.00	1,264	2.31	6,226	11.37	311	0.57	7,801	14.3	Similar category: 100.0
>=30%	0	0.00	0	0.00	7	0.01	1,580	2.88	9,567	17.47	11,154	20.4
Total	5,483	10.01	19,064	34.80	11,921	21.77	8,427	15.38	9,878	18.04	54,773	100.0
In FFS 65+ Patients												
Risk Category												
0 to <15%	3,212	9.51	2,218	6.57	0	0.00	0	0.00	0	0.00	5,430	16.1
15% to <20%	21	0.06	8,854	26.21	918	2.72	0	0.00	0	0.00	9,793	29.0
20% to <25%	0	0.00	348	1.03	5,684	16.82	391	1.16	0	0.00	6,423	19.0	Same category: 82.4
25% to <30%	0	0.00	0	0.00	813	2.41	3,896	11.53	198	0.59	4,907	14.5	Similar category: 100.0
>=30%	0	0.00	0	0.00	4	0.01	1,025	3.03	6,202	18.36	7,231	21.4
Total	3,233	9.57	11,420	33.81	7,419	21.96	5,312	15.72	6,400	18.95	33,784	100.0
In Non-FFS 65+ Patients												
Risk Category												
0 to <15%	2,239	10.67	1,575	7.50	0	0.00	0	0.00	0	0.00	3,814	18.2
15% to <20%	11	0.05	5,849	27.87	630	3.00	0	0.00	0	0.00	6,490	30.9
20% to <25%	0	0.00	220	1.05	3,418	16.28	230	1.10	0	0.00	3,868	18.4	Same category: 82.0
25% to <30%	0	0.00	0	0.00	451	2.15	2,330	11.10	113	0.54	2,894	13.8	Similar category: 100.0
>=30%	0	0.00	0	0.00	3	0.01	555	2.64	3,365	16.03	3,923	18.7
Total	2,250	10.72	7,644	36.42	4,502	21.44	3,115	14.84	3,478	16.57	20,989	100.0
In All 18-64 Patients												
Risk Category												
0 to <15%	3,385	15.55	0	0.00	0	0.00	0	0.00	0	0.00	3,385	15.6
15% to <20%	3,204	14.72	3,048	14.01	121	0.56	0	0.00	0	0.00	6,373	29.3
20% to <25%	5	0.02	1,008	4.63	2,124	9.76	459	2.11	13	0.06	3,609	16.6	Same category: 70.9
25% to <30%	0	0.00	14	0.06	408	1.87	1,505	6.92	829	3.81	2,756	12.7	Similar category: 99.8
>=30%	0	0.00	0	0.00	14	0.06	268	1.23	5,358	24.62	5,640	25.9
Total	6,594	30.29	4,070	18.70	2,667	12.25	2,232	10.26	6,200	28.49	21,763	100.0

Table 13a. AMI Mortality Model Performance for Models With and Without Interaction Terms (N = 39,481)
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

AMI Mortality Model	C-statistic	SE	Lower	Upper
With interaction terms	0.767	0.004	0.760	0.774
Without interaction terms	0.765	0.004	0.758	0.772

Figure 4a. Scatterplot of AMI Risk-Standardized Mortality Rates (RSMRs) from Models With and Without Interaction Terms
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals
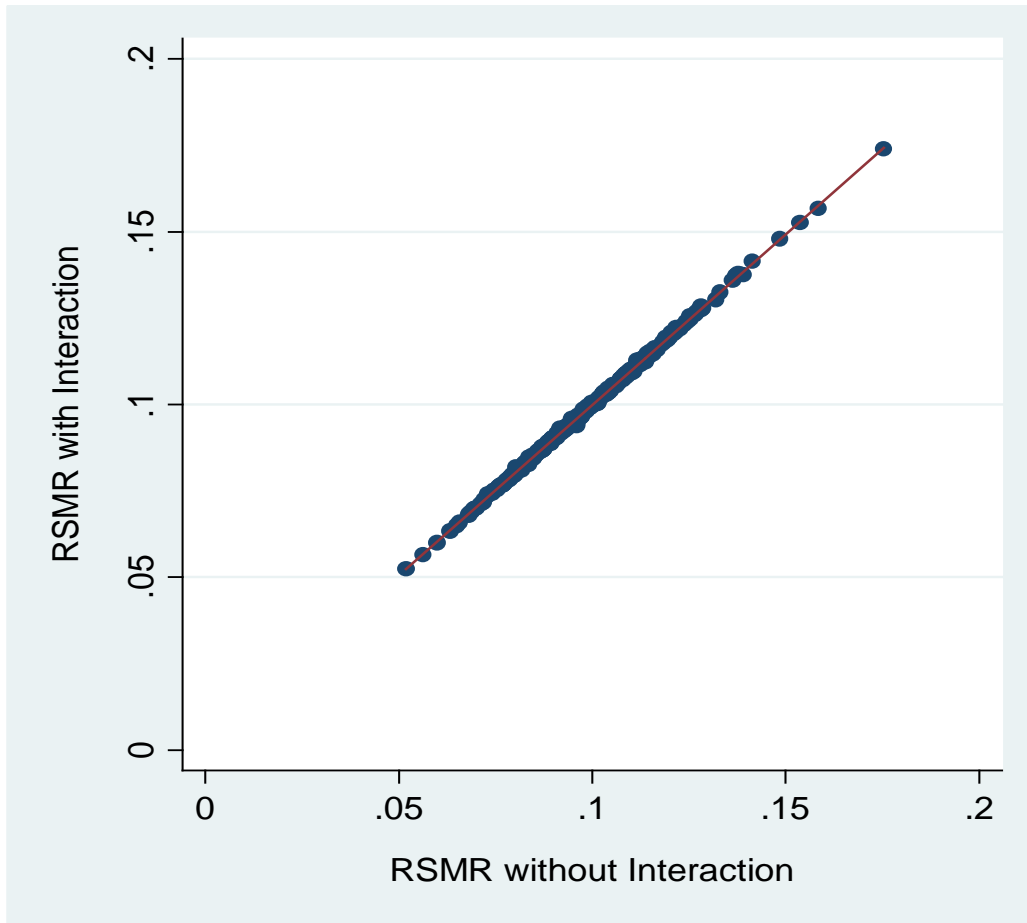

Correlation Coefficients (Weighted by Hospital Volume): 0.99879

Table 13b. HF Mortality Model Performance for Models With and Without Interaction Terms (N = 60,022)
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

HF Mortality Model	C-statistic	SE	Lower	Upper
With interaction terms	0.720	0.003	0.714	0.727
Without interaction terms	0.718	0.003	0.712	0.725

Figure 4b. Scatterplot of HF Risk-Standardized Mortality Rates (RSMRs) from Models With and Without Interaction Terms
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals
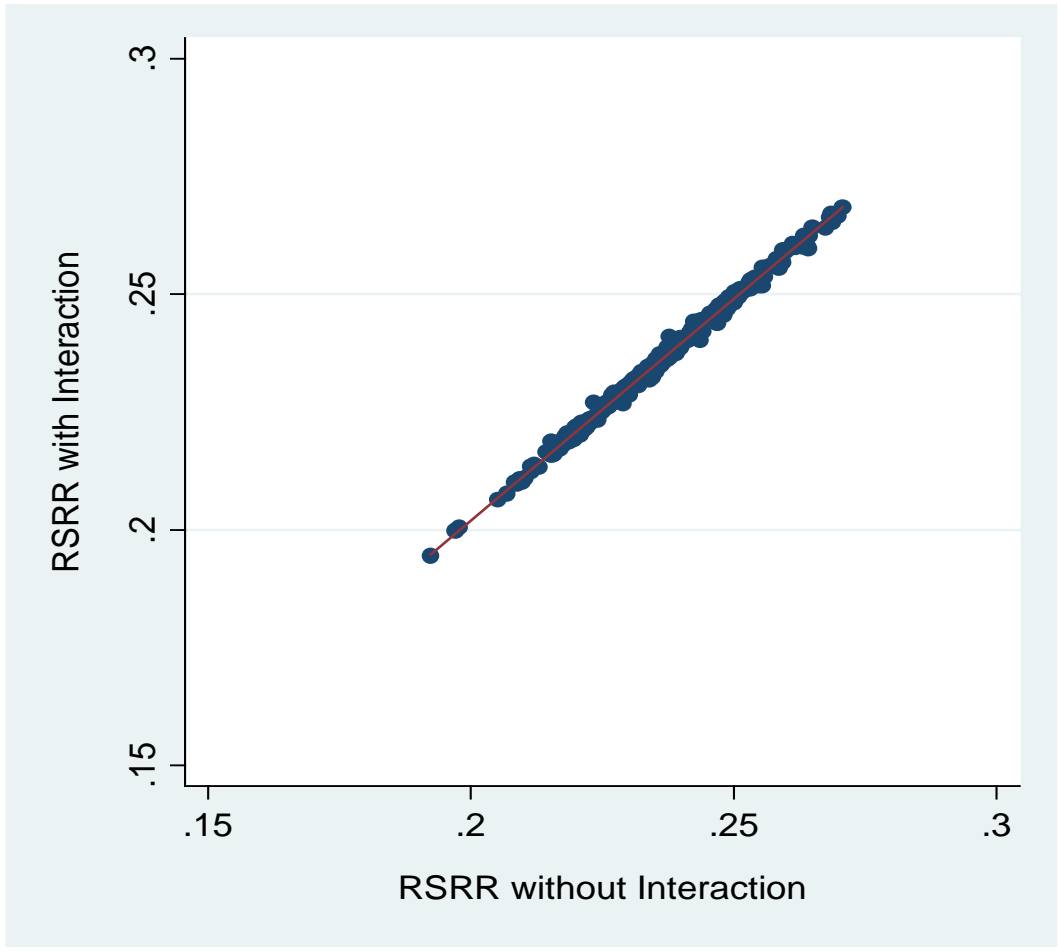

Correlation Coefficients (Weighted by Hospital Volume): 0.99971

Table 13c. HF Readmission Model Performance for Models With and Without Interaction Terms (N = 76,536)
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

HF Readmission Model	C-statistic	SE	Lower	Upper
With interaction terms	0.640	0.002	0.636	0.645
Without interaction terms	0.638	0.002	0.633	0.642

Figure 4c. Scatterplot of HF Risk-Standardized Readmission Rates (RSRRs) from Models With and Without Interaction Terms
Data Source: 2006 California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals

Correlation Coefficients (Weighted by Hospital Volume): 0.99787