NATIONAL QUALITY FORUM

Measure Submission and Evaluation Worksheet 5.0

This form contains the information submitted by measure developers/stewards, organized according to NQF's measure evaluation criteria and process. The evaluation criteria, evaluation guidance documents, and a blank online submission form are available on the submitting standards web page.

NQF #: 0468 NQF Project: Pulmonary Project

(for Endorsement Maintenance Review)
Original Endorsement Date: Mar 09, 2007 Most Recent Endorsement Date: Mar 09, 2007

BRIEF MEASURE INFORMATION

De.1 Measure Title: Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following pneumonia hospitalization

Co.1.1 Measure Steward: Centers for Medicare & Medicaid Services

De.2 Brief Description of Measure: The measure estimates a hospital-level risk-standardized mortality rate (RSMR) defined as death for any cause within 30 days of the admission date for the index hospitalization for patients discharged from the hospital with a principal diagnosis of pneumonia. The target population is patients 18 and over. CMS annually reports the measure for patients who are 65 years or older and are either enrolled in fee-for-service (FFS) Medicare and hospitalized in non-federal hospitals or are hospitalized in Veterans Health Administration (VA) facilities.

Since NQF-endorsement, the measure has been tested and shown to perform well in an all-payer population aged 18 and older and has been re-specified for this broader age group. The full details of the all-payer analysis and testing are attached.

2a1.1 Numerator Statement: The outcome for this measure is 30-day all-cause mortality. We define all-cause mortality as death from any cause within 30 days of the index admission date for patients discharged from the hospital with a principal diagnosis of pneumonia.

The numerator of the risk-adjusted ratio is the predicted number of deaths within 30 days given the hospital's performance with its observed case mix. The term "predicted" describes the numerator result, which is calculated using the hospital-specific intercept term. (See details below in the 2a1.13 Statistical risk model and variables.)

2a1.4 Denominator Statement: The cohort includes admissions for patients 18 and over hospitalized for pneumonia. The measure is currently publicly reported by CMS for patients 65 years and older who are either enrolled in Medicare FFS and admitted to non-federal, or admitted to VA hospitals.

The measure includes admissions for patients discharged from the hospital with a principal diagnosis of pneumonia and with a complete claims history for the 12 months prior to admission. If a patient has more than one pneumonia admission in a year, one hospitalization is randomly selected for inclusion in the measure.

2a1.8 Denominator Exclusions: The measure excludes admissions for patients:

For all cohorts, the measure excludes admissions for patients:
- discharged alive on the day of admission or the following day and did not get transferred (because it is unlikely they had a significant pneumonia diagnosis);
- transferred from another acute care hospital (because the death is attributed to the hospital where the patient was initially admitted);
- with inconsistent or unknown vital status or other unreliable data (e.g. date of death precedes admission date);
- discharged against medical advice (AMA) (because providers did not have the opportunity to deliver full care and prepare the patient for discharge);

For Medicare FFS patients, the measure additionally excludes admissions for patients:
- enrolled in the Medicare Hospice program any time in the 12 months prior to the index hospitalization including the first

day of the index admission (since it is likely these patients are continuing to seek comfort measures only);

1.1 Measure Type: Outcome
2a1. 25-26 Data Source: Administrative claims, Other
2a1.33 Level of Analysis: Facility

1.2-1.4 Is this measure paired with another measure? No

De.3 If included in a composite, please identify the composite measure (*title and NQF number if endorsed*):
This measure is not formally paired with another measure, however this measure is harmonized with a measure of hospital-level, all-cause, 30-day, risk-standardized readmission following a pneumonia hospitalization.

STAFF NOTES (*issues or questions regarding any criteria*)
Comments on Conditions for Consideration:
Is the measure untested? Yes☐ No☐ If untested, explain how it meets criteria for consideration for time-limited endorsement:
1a. Specific national health goal/priority identified by DHHS or NPP addressed by the measure (*check De.5*): 5. Similar/related endorsed or submitted measures (*check 5.1*): Other Criteria:
Staff Reviewer Name(s):

1. IMPACT, OPPORTUITY, EVIDENCE - IMPORTANCE TO MEASURE AND REPORT

Importance to Measure and Report is a threshold criterion that must be met in order to recommend a measure for endorsement. All three subcriteria must be met to pass this criterion. See guidance on evidence.
Measures must be judged to be important to measure and report in order to be evaluated against the remaining criteria. (evaluation criteria)

1a. High Impact: H☐ M☐ L☐ I☐
(*The measure directly addresses a specific national health goal/priority identified by DHHS or NPP, or some other high impact aspect of healthcare.*)

De.4 Subject/Topic Areas *(Check all the areas that apply)*: Pulmonary/Critical Care : Pneumonia
De.5 Cross Cutting Areas (*Check all the areas that apply)*: Care Coordination, Population Health, Safety : Complications, Safety : Healthcare Associated Infections

1a.1 Demonstrated High Impact Aspect of Healthcare: Affects large numbers, A leading cause of morbidity/mortality, High resource use, Patient/societal consequences of poor quality, Severity of illness

1a.2 If "Other," please describe:

1a.3 Summary of Evidence of High Impact *(Provide epidemiologic or resource use data)*:
Among patients over 65 years of age, pneumonia is the second leading cause of hospitalization, and is the leading infectious cause of death (Lindenauer et al., 2011). Many current hospital interventions are known to decrease the risk of death within 30 days of hospital admission (Jha et. al., 2007). Current process-based performance measures, however, cannot capture all the ways that care within the hospital might influence outcomes. As a result, many stakeholders, including patient organizations, are interested in outcomes measures that allow patients and providers to assess relative outcomes performance for hospitals (Bratzler et al., 2007).

1a.4 Citations for Evidence of High Impact cited in 1a.3: Bratzler, DW, Nsa W, Houck PM. Performance measures for pneumonia: are they valuable, and are process measures adequate. Current Opinion in Infectious Diseases. 20(2):182-189, April 2007.

Jha AK, Orav EJ, Li Z, Epstein AM. The inverse relationship between mortality rates and performance in the Hospital Quality

Alliance measures. Health Aff (Millwood) 2007 Jul-Aug;26(4):1104-10.

Lindenauer PK, Normand SL, Drye EE, et al. Development, validation, and results of a measure of 30-day readmission following hospitalization for pneumonia. J Hosp Med. 2011;6(3):142-150

1b. Opportunity for Improvement: H☐ M☐ L☐ I ☐
(*There is a demonstrated performance gap - variability or overall less than optimal performance*)

1b.1 Briefly explain the benefits (improvements in quality) envisioned by use of this measure:
The goal of this measure is to improve patient outcomes by providing patients, physicians, and hospitals with information about hospital-level, risk-standardized mortality rates following hospitalization for pneumonia. Measurement of patient outcomes allows for a broad view of quality of care that encompasses more than what can be captured by individual process-of-care measures. Complex and critical aspects of care, such as communication between providers, prevention of, and response to, complications, patient safety and coordinated transitions to the outpatient environment, all contribute to patient outcomes but are difficult to measure by individual process measures. The goal of outcomes measurement is to risk-adjust for patients' conditions at the time of hospital admission and then evaluate patient outcomes. This mortality measure was developed to identify institutions, whose performance is better or worse than would be expected based on their patient case-mix, and therefore promote hospital quality improvement and better inform consumers about care quality.

1b.2 Summary of Data Demonstrating Performance Gap *(Variation or overall less than optimal performance across providers)*: [*For Maintenance – Descriptive statistics for performance results for this measure - distribution of scores for measured entities by quartile/decile, mean, median, SD, min, max, etc.*]
Recent analyses show substantial variation in pneumonia RSMRs among hospitals. For recent three years of data (1/2007-12/2009) the mean hospital RSMR was 11.7% with a range of 6.9% to 20.4%. The interquartile range was 10.4% to 12.8%.

1b.3 Citations for Data on Performance Gap: [*For Maintenance – Description of the data or sample for measure results reported in 1b.2 including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included*]
Lindenauer PK, Bernheim SM, Grady JN, et al. The performance of US hospitals as reflected in risk-standardized 30-day mortality and readmission rates for medicare beneficiaries with pneumonia. J Hosp Med. 2010;5(6):E12-E18

1b.4 Summary of Data on Disparities by Population Group: [*For Maintenance –Descriptive statistics for performance results for this measure by population group*]
The measure is a hospital-level measure and therefore CMS assessed evidence of disparities by examining hospital performance based on the proportion of African-American patients or the proportion of low-income patients served by a hospital.

The analyses examining the proportion of African-American patients that a hospital served show no difference in performance on RSMR for hospitals with higher proportions of African-American patients. We divided hospitals into deciles based on the proportions of their patients that were African-American and looked at hospital performance on the measures across deciles. The combined lowest 5 deciles of hospitals include hospitals that have fewer than 5% African-American patients and have a median pneumonia RSMR of 11.5% (range 7.1%- 19.5%). In comparison, hospitals in the highest decile with >25% African American patients have a median pneumonia RSMR of 11.5% (range 7.1%-18.2%). These analyses demonstrate wide variation in hospital performance regardless of the proportion of minority patients and suggest that hospitals with large proportions of African American patients are not consistently performing at a lower or higher level than other hospitals.

Similar analyses were completed to evaluate hospital differences in performance on RSMR based on the socioeconomic status (SES) of their patients. The SES analyses show a slightly higher median RSMR at the hospitals in the lowest quartile based on the SES of their patients (as measured by median of the patients' zip-code level median income). The median RSMR in the lowest quartile is 11.7% as compared to median RSMR of 10.9% for hospitals in highest quartile. However, as in the above analyses by race, the ranges for the two groups are largely overlapping (6.8%-20.7% vs. 6.8%-19.5%, respectively) demonstrating that substantial numbers of hospitals serving low SES patients perform well on the measure.

Overall these analyses provide little compelling evidence of clinically significant disparities at the hospital level.

1b.5 Citations for Data on Disparities Cited in 1b.4: [*For Maintenance – Description of the data or sample for measure results reported in 1b.4 including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities*

included]
The sample for the above analyses is from a similar 3 year cohort of hospitalizations as the data for the performance gap analysis above (January 2006- December 2008) but limited to hospitals with at least 25 pneumonia cases over the 3 year period, a total of 4,907 hospitals.

Medicare Hospital Quality Chartbook 2010. Performance Report on Outcomes Measures for Acute Myocardial Infarction, Heart Failure, and Pneumonia. Yale New Haven Health System Corporation/Center for Outcomes Research and Evaluation. New Haven, CT: 2010. (http://cms.gov/HospitalQualityInits/20_OutcomeMeasures.asp#TopOfPage)

1c. Evidence (*Measure focus is a health outcome OR meets the criteria for quantity, quality, consistency of the body of evidence.*)
Is the measure focus a health outcome? Yes☐ No☐ If not a health outcome, rate the body of evidence.

Quantity: H☐ M☐ L☐ I ☐ Quality: H☐ M☐ L☐ I ☐ Consistency: H☐ M☐ L☐ I ☐

Quantity	Quality	Consistency	Does the measure pass subcriterion1c?
M-H	M-H	M-H	Yes☐
L	M-H	M	Yes☐ IF additional research unlikely to change conclusion that benefits to patients outweigh harms: otherwise No☐
M-H	L	M-H	Yes☐ IF potential benefits to patients clearly outweigh potential harms: otherwise No☐
L-M-H	L-M-H	L	No ☐

Health outcome – rationale supports relationship to at least one healthcare structure, process, intervention, or service	Does the measure pass subcriterion1c? Yes☐ IF rationale supports relationship

1c.1 Structure-Process-Outcome Relationship *(Briefly state the measure focus, e.g., health outcome, intermediate clinical outcome, process, structure; then identify the appropriate links, e.g., structure-process-health outcome; process- health outcome; intermediate clinical outcome-health outcome)*:
This measure calculates hospital-level, 30-day all-cause mortality rates after hospitalization for pneumonia. The goal is to directly affect patient outcomes by measuring risk-standardized rates of mortality.

1c.2-3 Type of Evidence *(Check all that apply)*:
Other
N/A This is an outcomes measure, not a process measure.

1c.4 Directness of Evidence to the Specified Measure *(State the central topic, population, and outcomes addressed in the body of evidence and identify any differences from the measure focus and measure target population)*:
N/A This is an outcomes measure, not a process measure.

1c.5 Quantity of Studies in the Body of Evidence *(Total number of studies, not articles)*: N/A This is an outcomes measure, not a process measure.

1c.6 Quality of Body of Evidence (*Summarize the certainty or confidence in the estimates of benefits and harms to patients across studies in the body of evidence resulting from study factors. Please address: a) study design/flaws; b) directness/indirectness of the evidence to this measure (e.g., interventions, comparisons, outcomes assessed, population included in the evidence); and c) imprecision/wide confidence intervals due to few patients or events*): N/A This is an outcomes measure, not a process measure.

1c.7 Consistency of Results across Studies *(Summarize the consistency of the magnitude and direction of the effect):* N/A This is an outcomes measure, not a process measure.

1c.8 Net Benefit *(Provide estimates of effect for benefit/outcome; identify harms addressed and estimates of effect; and net benefit - benefit over harms)*:
N/A This is an outcomes measure, not a process measure.

1c.9 Grading of Strength/Quality of the Body of Evidence. Has the body of evidence been graded? No

1c.10 If body of evidence graded, identify the entity that graded the evidence including balance of representation and any disclosures regarding bias: N/A This is an outcomes measure, not a process measure.

1c.11 System Used for Grading the Body of Evidence: Other

1c.12 If other, identify and describe the grading scale with definitions: N/A This is an outcomes measure, not a process measure.

1c.13 Grade Assigned to the Body of Evidence: N/A This is an outcomes measure, not a process measure.

1c.14 Summary of Controversy/Contradictory Evidence: All-cause Mortality
This measure calculates a 30-day all-cause mortality rate. CMS measures all-cause mortality rather than mortality due to certain conditions (e.g. heart failure) for a number of reasons. First, a narrow focus on specific causes of mortality may simply provide an incentive to shift patients away from those codes. Second, within the chain of events that lead to a patient passing away there is often some aspect of care that could be improved, thereby reducing the risk of death. This is not to suggest that all deaths are preventable, but the goal of the measure is to encourage broad approaches to quality improvement which will thereby lower all patients' risk of mortality. More narrowly defining mortality measures to those that are disease specific may incentivize a limited focus on improvements in care as opposed to thinking comprehensively about the patient's full medical and social needs at discharge. Factors which may influence mortality rates include medication reconciliation, patient education, follow-up care and communication between inpatient and outpatient providers. The goal is not to reduce the mortality rate to zero but to reduce overall mortality rates to what is achievable by the best hospitals.

Effect of Patient Preferences Regarding End of Life Care
Some stakeholders have expressed concerns that our measure cannot adequately exclude patients who choose comfort measures or palliative care during their index hospitalization. Stakeholders are concerned that this could lead to unintended consequences, such as prolonging lives against patient wishes. To address these issues CMS has taken the following steps:

(1) added an exclusion for patients who are enrolled in hospice prior to, or on the day of, admission.
(2) chose not to exclude patients who are discharged to hospice or seek a palliative care consult during admission to account for the fact that the choice of palliative/comfort care may be the result of poor care.
(3) accounted for risk-factors associated with the end of life by including markers of frailty within the risk-adjustment variables, including: protein-calorie malnutrition, dementia or senility, and hemiplegia, paraplegia, paralysis and functional disability.
(4) will further consider clinical and measurement issues for patients for whom survival is not an objective.

1c.15 Citations for Evidence other than Guidelines*(Guidelines addressed below)*:
N/A This is an outcomes measure, not a process measure.

1c.16 Quote verbatim, the specific guideline recommendation *(Including guideline # and/or page #)*:
N/A This is an outcomes measure, not a process measure.

1c.17 Clinical Practice Guideline Citation: N/A This is an outcomes measure, not a process measure.

1c.18 National Guideline Clearinghouse or other URL: N/A This is an outcomes measure, not a process measure.

1c.19 Grading of Strength of Guideline Recommendation. Has the recommendation been graded? No

1c.20 If guideline recommendation graded, identify the entity that graded the evidence including balance of representation and any disclosures regarding bias:

1c.21 System Used for Grading the Strength of Guideline Recommendation: Other

1c.22 If other, identify and describe the grading scale with definitions: N/A This is an outcomes measure, not a process

measure.

1c.23 Grade Assigned to the Recommendation: N/A This is an outcomes measure, not a process measure.

1c.24 Rationale for Using this Guideline Over Others: N/A This is an outcomes measure, not a process measure.

Based on the NQF descriptions for rating the evidence, what was the developer's assessment of the quantity, quality, and consistency of the body of evidence?
1c.25 Quantity: High 1c.26 Quality: High1c.27 Consistency: High

Was the threshold criterion, *Importance to Measure and Report*, met?
(*1a & 1b must be rated moderate or high and 1c yes*) Yes☐ No☐
Provide rationale based on specific subcriteria:

For a new measure if the Committee votes NO, then STOP.
For a measure undergoing endorsement maintenance, if the Committee votes NO because of 1b. (no opportunity for improvement), it may be considered for continued endorsement and all criteria need to be evaluated.

2. RELIABILITY & VALIDITY - SCIENTIFIC ACCEPTABILITY OF MEASURE PROPERTIES

Extent to which the measure, as specified, produces consistent (reliable) and credible (valid) results about the quality of care when implemented. (evaluation criteria)
Measure testing must demonstrate adequate reliability and validity in order to be recommended for endorsement. Testing may be conducted for data elements and/or the computed measure score. Testing information and results should be entered in the appropriate field. Supplemental materials may be referenced or attached in item 2.1. See guidance on measure testing.

S.1 Measure Web Page *(In the future, NQF will require measure stewards to provide a URL link to a web page where current detailed specifications can be obtained*). Do you have a web page where current detailed specifications for this measure can be obtained? Yes

S.2 If yes, provide web page URL: www.qualitynet.org

2a. RELIABILITY. Precise Specifications and Reliability Testing: H☐ M☐ L☐ I ☐

2a1. Precise Measure Specifications. (*The measure specifications precise and unambiguous.*)

2a1.1 Numerator Statement *(Brief, narrative description of the measure focus or what is being measured about the target population, e.g., cases from the target population with the target process, condition, event, or outcome)*:
The outcome for this measure is 30-day all-cause mortality. We define all-cause mortality as death from any cause within 30 days of the index admission date for patients discharged from the hospital with a principal diagnosis of pneumonia.

The numerator of the risk-adjusted ratio is the predicted number of deaths within 30 days given the hospital's performance with its observed case mix. The term "predicted" describes the numerator result, which is calculated using the hospital-specific intercept term. (See details below in the 2a1.13 Statistical risk model and variables.)

2a1.2 Numerator Time Window *(The time period in which the target process, condition, event, or outcome is eligible for inclusion)*:
We define this as death from any cause within 30 days from the admission date for the index pneumonia hospitalization.

2a1.3 Numerator Details *(All information required to identify and calculate the cases from the target population with the target process, condition, event, or outcome such as definitions, codes with descriptors, and/or specific data collection items/responses*:
Note: This outcome measure does not have a traditional numerator and denominator like a core process measure (e.g., percentage of adult patients with diabetes aged 18-75 years receiving one or more hemoglobin A1c tests per year); thus, we use this field to define the measure outcome.

The measure counts deaths from any cause within 30 days from admission date of the index hospitalization.

Identifying deaths in the FFS measure

As currently reported, we identify deaths for FFS Medicare patients 65 years and older in the Medicare Enrollment Database (EDB).

Identifying deaths in the all-payer measure
For the purposes of development, deaths were identified using the California vital statistics data file. Nationally, post-discharge deaths can be identified using an external source of vital status, such as the Social Security Administration's Death Master File (DMF) or the Centers for Disease Control and Prevention's National Death Index (NDI)

2a1.4 Denominator Statement *(Brief, narrative description of the target population being measured)*:
The cohort includes admissions for patients 18 and over hospitalized for pneumonia. The measure is currently publicly reported by CMS for patients 65 years and older who are either enrolled in Medicare FFS and admitted to non-federal , or admitted to VA hospitals.

The measure includes admissions for patients discharged from the hospital with a principal diagnosis of pneumonia and with a complete claims history for the 12 months prior to admission. If a patient has more than one pneumonia admission in a year, one hospitalization is randomly selected for inclusion in the measure.

2a1.5 Target Population Category *(Check all the populations for which the measure is specified and tested if any)*: Adult/Elderly Care, Populations at Risk

2a1.6 Denominator Time Window *(The time period in which cases are eligible for inclusion)*:
This measure was developed with 12 months of data. Currently the measure is publicly-reported with three years of index hospitalizations.

2a1.7 Denominator Details (*All information required to identify and calculate the target population/denominator such as definitions, codes with descriptors, and/or specific data collection items/responses)*:
This outcome measure does not have a traditional numerator and denominator like a core process measure (e.g., percentage of adult patients with diabetes aged 18-75 years receiving one or more hemoglobin A1c tests per year); thus, we use this field to define the measure cohort.

The denominator includes patients 18 and over hospitalized for pneumonia. The measure is currently publicly reported by CMS for patients 65 years and older who are either enrolled in Medicare FFS and admitted to non-federal hospitals, or admitted to a VA hospital. To be included in the Medicare FFS cohort the patients must have been continuously enrolled in Medicare FFS Parts A and B for the 12 months prior to the index hospitalization.

The denominator includes admissions for patients discharged from the hospital with a principal diagnosis of pneumonia (ICD-9-CM codes 480.0, 480.1, 480.2, 480.3, 480.8, 480.9, 481, 482.0, 482.1, 482.2, 482.30, 482.31, 482.32, 482.39, 482.40, 482.41, 482.42, 482.49, 482.81, 482.82, 482.83, 482.84, 482.89, 482.9, 483.0, 483.1, 483.8, 485, 486, 487.0, and 488.11; ICD-10-CM codes J120, J121, J122, J1281, J1289, J129, J13, J181, J150, J151, J14, J154, J154, J153, J154, J1520, J1521, J1521, Z16, J1529, J158, J155, J156, A481, J158, J159, J157, J160, J168, J180, J189, J1100, J129, J09119).

2a1.8 Denominator Exclusions *(Brief narrative description of exclusions from the target population)*:
The measure excludes admissions for patients:

For all cohorts, the measure excludes admissions for patients:
- discharged alive on the day of admission or the following day and did not get transferred (because it is unlikely they had a significant pneumonia diagnosis);
- transferred from another acute care hospital (because the death is attributed to the hospital where the patient was initially admitted);
- with inconsistent or unknown vital status or other unreliable data (e.g. date of death precedes admission date);
- discharged against medical advice (AMA) (because providers did not have the opportunity to deliver full care and prepare the patient for discharge);

For Medicare FFS patients, the measure additionally excludes admissions for patients:
- enrolled in the Medicare Hospice program any time in the 12 months prior to the index hospitalization including the first

day of the index admission (since it is likely these patients are continuing to seek comfort measures only);

2a1.9 Denominator Exclusion Details *(All information required to identify and calculate exclusions from the denominator such as definitions, codes with descriptors, and/or specific data collection items/responses)*:
Measure exclusions are determined as follows

For all cohorts, the measure excludes admissions for patients:
- Admissions for patients who were discharged alive on the day of admission or the following day and did not get transferred are identified by comparing the admission and discharge dates and examining the discharge destination indicator;
- Admissions for patients who were transferred from another acute care hospital or VA hospital are identified in the claims when a patient with a qualifying admission is discharged from an acute care hospital and admitted to another acute care hospital on the same day or next day;
- Inconsistent vital status or unreliable data are identified if any of the following conditions are met 1) the patient's age is greater than 115 years: 2) if the discharge date for a hospitalization is before the admission date; 3) if the patient has a sex other than "male" or "female";
- Discharges against medical advice (AMA) are identified by examining the discharge destination indicator;

For Medicare FFS patients, the measure additionally excludes admissions for patients:
- with Hospice enrollment in the 12 months prior to or on the index admission is identified using enrollment status derived from the EDB and the Inpatient SAF;

2a1.10 Stratification Details/Variables *(All information required to stratify the measure results including the stratification variables, codes with descriptors, definitions, and/or specific data collection items/responses)*:
N/A

2a1.11 Risk Adjustment Type *(Select type. Provide specifications for risk stratification in 2a1.10 and for statistical model in 2a1.13)*: Statistical risk model 2a1.12 If "Other," please describe:

2a1.13 Statistical Risk Model and Variables *(Name the statistical method - e.g., logistic regression and list all the risk factor variables. Note - risk model development should be addressed in 2b4.)*:
Our approach to risk adjustment is tailored to and appropriate for a publicly reported outcome measure, as articulated in the American Heart Association (AHA) Scientific Statement, "Standards for Statistical Models Used for Public Reporting of Health Outcomes" (Krumholz et. al., 2006).

The proposed measure employs a hierarchical logistic regression model to create a hospital level 30-day RSMR. In brief, the approach simultaneously models two levels (patient and hospital) to account for the variance in patient outcomes within and between hospitals(Normand & Shahian, 2007). At the patient level, each model adjusts the log-odds of mortality within 30 days of admission for age and selected clinical covariates. The second level models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of mortality, after accounting for patient risk. See section 2a1.20. Calculation Algorithm/Measure Logic for more detail.

Candidate and Final Risk-adjustment Variables: Candidate variables were patient-level risk-adjustors that were expected to be predictive of mortality, based on empirical analysis, prior literature, and clinical judgment, including age and indicators of comorbidity and disease severity. For each patient, covariates are obtained from Medicare claims extending 12 months prior to and including the index admission. The model adjusts for case mix differences based on the clinical status of patients at the time of admission. We use condition categories (CCs), which are clinically meaningful groupings of more than 15,000 ICD-9-CM diagnosis codes. A file which contains a list of the ICD-9-CM codes and their groupings into CCs is available at http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier3&cid=1182785083979. In addition, only comorbidities that convey information about the patient at that time or in the 12-months prior, and not complications that arise during the course of the hospitalization are included in the risk-adjustment. Hence, we do not risk-adjust for CCs that may represent adverse events of care and that are only recorded in the index admission.

The final set of risk-adjustment variables is:

Demographic	Age-65 (years above 65, continuous)
	Male
Cardiovascular	History of PTCA
	History of CABG
	Congestive heart failure (CC 80)
	Acute Myocardial Infarction (CC 81)
	Unstable angina (CC 82)
	Chronic atherosclerosis (CC 83, 84)
	Cardio-respiratory failure and shock (CC 79)
Comorbidity	Hypertension (CC 89, 91)
	Stroke (CC 95, 96)
	Cerebrovascular disease (CC 97-99, 103)
	Renal failure (CC 131)
	Chronic Obstructive Pulmonary Disease (CC 108)
	Pneumonia (CC 111-113)
	Protein-calorie malnutrition (CC 21)
	Dementia and senility (CC 49, 50)
	Hemiplegia, paraplegia, paralysis, functional disability (CC 67-69, 100-102, 177, 178)
	Peripheral vascular disease (CC104, 105)
	Metastatic cancer and acute leukemia and other severe cancers (CC 7, 8)
	Trauma in the last year (CC154-156, 158-162)
	Major psychiatric disorders (CC54-56)
	Chronic liver disease (CC25-27)
	Severe hematological disorders (CC44)
	Iron deficiency/anemias/blood diseases (CC47)
	Depression (CC 58)
	Parkinson's/Huntington's diseases (CC73)
	Seizure disorders and convulsions (CC 74)
	Fibrosis of lung and other chronic lung disorders (CC109)
	Asthma (CC 110)
	Vertebral fractures (CC 157)

References:

Krumholz HM, Brindis RG, Brush JE, et al. 2006. Standards for Statistical Models Used for Public Reporting of Health Outcomes: An American Heart Association Scientific Statement From the Quality of Care and Outcomes Research Interdisciplinary Writing Group: Cosponsored by the Council on Epidemiology and Prevention and the Stroke Council Endorsed by the American College of Cardiology Foundation. Circulation 113: 456-462.

Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22 (2): 206-226.

2a1.14-16 Detailed Risk Model Available at Web page URL (or attachment). Include coefficients, equations, codes with descriptors, definitions, and/or specific data collection items/responses. Attach documents only if they are not available on a webpage and keep attached file to 5 MB or less. NQF strongly prefers you make documents available at a Web page URL. Please supply login/password if needed:

URL

http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier3&cid=1163010421830

2a1.17-18. Type of Score: Rate/proportion

2a1.19 Interpretation of Score *(Classifies interpretation of score according to whether better quality is associated with a higher score, a lower score, a score falling within a defined interval, or a passing score)*: Better quality = Lower score

2a1.20 Calculation Algorithm/Measure Logic*(Describe the calculation of the measure score as an ordered sequence of steps including identifying the target population; exclusions; cases meeting the target process, condition, event, or outcome; aggregating data; risk adjustment; etc.)*:
The proposed measure employs a hierarchical logistic regression model to create a hospital level 30-day RSMR. In brief, the approach simultaneously models two levels (patient and hospital) to account for the variance in patient outcomes within and between hospitals (Normand & Shahian, 2007). At the patient level, each model adjusts the log-odds of mortality within 30 days of admission for age and selected clinical covariates. The second level models the hospital-specific intercepts as arising from a normal distribution. The hospital intercept represents the underlying risk of mortality, after accounting for patient risk. The hospital-specific intercepts are given a distribution in order to account for the clustering (non-independence) of patients within the same hospital. If there were no differences among hospitals, then after adjusting for patient risk, the hospital intercepts should be identical across all hospitals.

The RSMR is calculated as the ratio of the number of "predicted" to the number of "expected" deaths, multiplied by the national unadjusted mortality rate. For each hospital, the numerator of the ratio ("predicted") is the number of deaths within 30 days predicted on the basis of the hospital's performance with its observed case mix, and the denominator ("expected") is the number of deaths expected on the basis of the nation's performance with that hospital's case mix. This approach is analogous to a ratio of "observed" to "expected" used in other types of statistical analyses. It conceptually allows for a comparison of a particular hospital's performance given its case-mix to an average hospital's performance with the same case-mix. Thus, a lower ratio indicates lower-than-expected mortality or better quality and a higher ratio indicates higher-than-expected mortality or worse quality.

The predicted hospital outcome (the numerator) is the sum of predicted probabilities of death for all patients at a particular hospital. The predicted probability of each patient in that hospital is calculated using the hospital-specific intercept and patient risk factors. The expected number of deaths (the denominator) is the sum of expected probabilities of death for all patients at a hospital. The expected probability of each patient in a hospital is calculated using a common intercept and patient risk factors.

References:

Normand S-LT, Shahian DM. 2007. Statistical and Clinical Aspects of Hospital Outcomes Profiling. Stat Sci 22 (2): 206-226.

2a1.21-23 Calculation Algorithm/Measure Logic Diagram URL or attachment:
URL
http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier3&cid=1163010421830

2a1.24 Sampling (Survey) Methodology. If measure is based on a sample (or survey), provide instructions for obtaining the sample, conducting the survey and guidance on minimum sample size (response rate):
N/A –This measure is not based on a sample or survey.

2a1.25 Data Source *(Check all the sources for which the measure is specified and tested*). If other, please describe:
Administrative claims, Other

2a1.26 Data Source/Data Collection Instrument (*Identify the specific data source/data collection instrument, e.g. name of database, clinical registry, collection instrument, etc.*): Data sources for the FFS measure:
1. Medicare Part A inpatient and Part B outpatient claims: This database contains claims data for fee-for service inpatient and outpatient services including: Medicare inpatient hospital care, outpatient hospital services, skilled nursing facility care, some home health agency services, and hospice care, as well as inpatient and outpatient claims for the 12 months prior to an index admission.

2. Medicare Enrollment Database (EDB): This database contains Medicare beneficiary demographic, benefit/coverage, and vital status information. This dataset was used to obtain information on several inclusion/exclusion indicators such as Medicare status on admission as well as vital status. These data have previously been shown to accurately reflect patient vital status (Fleming Fisher et al., 1992).

The measure was originally developed with claims data from a 2000 sample of 224,608 cases from 4,664 hospitals. We have maintained and re-evaluated the models each year since public reporting of the measure began in 2008.

Fleming C., Fisher ES, Chang CH, Bubolz D, Malenda J. Studying outcomes and hospital utilization in the elderly: The advantages of a merged data base for Medicare and Veterans Affairs Hospitals. Medical Care. 1992; 30(5): 377-91.

Data sources for the all-payer update:
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 non-Federal acute care 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 aged 65+ but also non-FFS Medicare patients aged 65+ and younger patients aged 18-64 years at the time of admission.

2a1.27-29 Data Source/data Collection Instrument Reference Web Page URL or Attachment:

2a1.30-32 Data Dictionary/Code Table Web Page URL or Attachment:
Attachment
508 compliant pneumonia ICD-10 map.pdf

2a1.33 Level of Analysis (*Check the levels of analysis for which the measure is specified and tested)*: Facility

2a1.34-35 Care Setting *(Check all the settings for which the measure is specified and tested)*: Hospital/Acute Care Facility

2a2. Reliability Testing. (*Reliability testing was conducted with appropriate method, scope, and adequate demonstration of reliability*.)

2a2.1 Data/Sample *(Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included)*:
Medicare Part A inpatient and outpatient claims data for calendar years 2007-2009 were used to test reliability. Specifically, two datasets were used to assess reliability:

2007-2009 Subset A1 (564,546 index hospital stays at 4,879 hospitals)
2007-2009 Subset A2 (564,545 hospital stays at 4,887 hospitals)
(Of note, Subsets A1 and A2 were created by randomly splitting the full 2007-2009 dataset)

2a2.2 Analytic Method *(Describe method of reliability testing & rationale)*:
Data element reliability
In constructing the measures we aim to utilize only those data elements from the claims that have both face validity and reliability. We avoid the use of fields that are thought to be coded inconsistently across hospitals or providers. Specifically, we use fields that are consequential for payment and which are audited. We identify such variables through empiric analyses and our understanding of CMS auditing and billing policies and seek to avoid variables which do not meet this standard. For example, "discharge disposition" is a variable in Medicare claims data that is not thought to be a reliable variable for identifying a transfer between two acute care facilities. Thus, we derive a variable using admission and discharge dates as a surrogate for "discharge disposition" to identify hospital admissions involving transfers. This allows us to identify these admissions using variables in the claims data which have greater reliability than the "discharge disposition" variable.

In addition, CMS has in place several hospital auditing programs used to assess overall claims code accuracy, to ensure appropriate billing, and for overpayment recoupment. CMS routinely conducts data analysis to identify potential problem areas and detect fraud, and audits important data fields used in our measures, including diagnosis and procedure codes and other elements that are consequential to payment.

Finally, we assess the reliability of the data elements by comparing model variable frequencies and odds ratios in 3 years of data.

Measure result reliability
The reliability of a measurement is the degree to which repeated measurements of the same entity agree with each other. For measures of hospital performance, the measured entity is naturally the hospital, and reliability is the extent to which repeated measurements of the same hospital give similar results. In line with this thinking, our approach to assessing reliability is to consider the extent to which assessments of a hospital using different but randomly selected subsets of patients produces similar measures of hospital performance. That is, we take a "test-retest" approach in which hospital performance is measured once using a random subset of patients, then measured again using a second random subset exclusive of the first, and the agreement of the two resulting performance measures compared across hospitals (Rousson et al., 2002

For test-retest reliability, we combined index admissions from successive measurement periods into one dataset, randomly sampled half of patients within each hospital, calculated the measure for each hospital, and repeated the calculation using the second half. Thus, each hospital is measured twice, but each measurement is made using an entirely distinct set of patients. To the extent that the calculated measures of these two subsets agree, we have evidence that the measure is assessing an attribute of the hospital, not of the patients. As a metric of agreement we calculated the intra-class correlation coefficient (Shrout and Fleiss, 1979), and assessed the values according to conventional standards(Landis and Koch, 1977). Specifically, we used data Subsets A1 and A2, and calculated the RSMR for each hospital for each sample. The agreement of the two RSMRs was quantified for hospitals in each sample using the intra-class correlation as defined by ICC (2,1) (Shrout and Fleiss, 1979).

Using two independent samples provides an honest estimate of the measure's reliability, compared with using two random but potentially overlapping samples which would exaggerate the agreement. Moreover, because our final measure is derived using hierarchical logistic regression, and a known property of hierarchical logistic regression models is that smaller volume hospitals contribute less ´signal´, a split sample using a single measurement period would introduce extra noise, potentially underestimating the actual test-retest reliability that would be achieved if the measure were reported using three years of data.

Rousson V, Gasser T, Seifert B. "Assessing intrarater, interrater and test–retest reliability of continuous measurements," Statistics in Medicine, 2002, 21:3431-3446.

Shrout P, Fleiss J. Intraclass correlations: uses in assessing rater reliability. Psychological Bulletin, 1979, 86, 420-3428.

Landis J, Koch G, The measurement of observer agreement for categorical data, Biometrics, 1977;33:159-174.

2a2.3 Testing Results *(Reliability statistics, assessment of adequacy in the context of norms for the test conducted)*:
Data element reliability results
Overall, risk factor frequencies changed very little across the three-year period, and there were no notable differences in the odds ratios across years of data.

Measure result reliability results
There were 1,129,091 admissions in the combined three-year sample, with 564,546 in one randomly selected sample and 564,545 in the remaining sample. The agreement between the two RSMRs for each hospital was 0.489, which according to the conventional interpretation is "Moderate" (Landis & Koch, 1977). The intra-class correlation coefficient is based on a split sample of 3 years of data, resulting in a volume of patients in each sample equivalent to only 1.5 years of data, whereas the measure is likely to be reported with a full three years of data. Based on our experiences with similar measures using split sample, with 4 years (and volume equivalent to 2 years), the intra-class correlation coefficient would be even higher.

References:
Landis J, Koch G, The measurement of observer agreement for categorical data, Biometrics, 1977;33:159-174.The ICC for the 2007-2009 Subsets was 0.406.

2b. VALIDITY. Validity, Testing, including all Threats to Validity: H☐ M☐ L☐ I ☐

2b1.1 Describe how the measure specifications *(measure focus, target population, and exclusions)* are consistent with the evidence cited in support of the measure focus (*criterion 1c)* and identify any differences from the evidence:

N/A

2b2. Validity Testing. (*Validity testing was conducted with appropriate method, scope, and adequate demonstration of validity.)*

2b2.1 Data/Sample *(Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included)*:
We validated the administrative model with a medical-record based model when the measure was created. For the derivation of the medical record-based model, we used cases identified through a CMS quality initiative, which sampled admissions from fee-for-service Medicare beneficiaries for several clinical conditions, including pneumonia (Jencks et. al., 2000). Cases were identified over a 6-month period within each state, plus the District of Columbia and Puerto Rico, during the period July 1, 1998 through March 31, 1999. Based on the principal discharge diagnosis, approximately 750 pneumonia discharges per state were identified, and the corresponding medical records were abstracted by 2 clinical data abstraction centers (DynKePRO [York, PA] and FMAS Corporation [Rockville, MD]). In states with fewer than 750 pneumonia discharges, all cases were used. CMS subsequently conducted a re-measurement using the same data collection methodology for 2000 and 2001 discharges, and the combined 1998-2001 data that including a total of 75,616 cases served as the national pneumonia dataset for development of the medical record-based model (Jencks et. al., 2003).

References:
Jencks SF, Cuerdon T, Burwen DR, et al. Quality of medical care delivered to Medicare beneficiaries: A profile at state and national levels. JAMA. Oct 4 2000;284(13):1670-1676.

Jencks SF, Huff ED, Cuerdon T. Change in the quality of care delivered to Medicare beneficiaries, 1998-1999 to 2000-2001. JAMA. Jan 15 2003;289(3):305-312.

2b2.2 Analytic Method *(Describe method of validity testing and rationale; if face validity, describe systematic assessment)*:
We sought to validate our best administrative pneumonia model against the medical record model in the same cohort of patients for which pneumonia medical record data were available. We developed a measure cohort with the medical record data using the inclusion/exclusion criteria and risk-adjustment strategy that was consistent with the claims-based administrative measure but using chart-based risk adjusters, such as blood pressure, not available in the claims data. We then matched a sample of the same patients in the administrative data for comparison. We compared the output of the two measures, that is the state performance results, in the same group of patients.

ICD-9 to ICD-10 Conversion

Statement of Intent

[X] Convert measure to the new code set, but there are no changes to the measure.
[ ] Take advantage of new specific code set for the measure with changes.
[ ] The intent of the measure has changed.

Process of Conversion

We enlisted the help of clinicians with expertise in relevant areas to select and evaluate which ICD-10 codes map to the ICD-9 codes currently in use for this measure. The conversion of ICD-9 to ICD-10 is currently ongoing and the codes we have selected cannot yet be finalized since we lack sufficient ICD-10 data to evaluate the accuracy of coding/prevalence of ICD-10 codes. Once ICD-10 codes are officially in place and more data is available we will be able to provide a more accurate crosswalk.

2b2.3 Testing Results *(Statistical results, assessment of adequacy in the context of norms for the test conducted; if face validity, describe results of systematic assessment)*:
The derivation sample contained 50,858 cases with an unadjusted mortality rate of 14.5%. Twenty covariates were included in the final model. In the linked dataset, the administrative model explained about 12% of the observed variation and had accuracy of 71%, while the medical record model explained 20% of the variation and had accuracy of 77%. Moreover, the predictive ability of the medical record model is good —observed mortality in the lowest estimated decile is 1.9% compared with 45.9% in the highest estimated decile, a range of 44.0%.

We also tested the performance of the 31 variables identified from the derivation sample in this medical record-based patient sample. The performance was not substantively different in this validation sample (R2 = 0.12 and ROC area = 0.71).

POTENTIAL THREATS TO VALIDITY. (*All potential threats to validity were appropriately tested with adequate results.*)

2b3. Measure Exclusions. (*Exclusions were supported by the clinical evidence in 1c or appropriately tested with results demonstrating the need to specify them.*)

2b3.1 Data/Sample for analysis of exclusions *(Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included)*:
We used all pneumonia admissions in 2007-2009 Medicare fee-for-service data (initial cohort which included 1,129,091 admissions) for the 65 and over model. We included 69,247 admissions in the 2006 all-payer California data for the 18 and over model.

2b3.2 Analytic Method (*Describe type of analysis and rationale for examining exclusions, including exclusion related to patient preference)*:
All exclusions were determined by careful clinical review and have been used based on clinically relevant decisions. These exclusions are consistent with similar NQF-approved mortality measures.

2b3.3 Results *(Provide statistical results for analysis of exclusions, e.g., frequency, variability, sensitivity analyses):*
For the 65 and over model we examined overall frequencies and proportions of the admissions excluded for each exclusion criterion in all pneumonia admissions in 2007-2009 Medicare fee-for-service data (initial cohort included 1,129,091 admissions). The exclusion categories are not mutually exclusive.

1. Same or next day discharge, and patient did not die, transfer, or leave against medical advice (3.67%)
2. Transfers into the hospital (0.41%)
3. Inconsistent or unknown vital status (0.01%)
4. In hospice within one year prior to or on the day of admission (1.55%)
5. Discharges against medical advice (AMA) (0.28%)
6. Unreliable data (0.03%)
7. Excluded based on random selection of one hospitalization per patient per year (8.84%)
8. Not the first hospitalization in the 30 days prior to a patient's death (0.01%)

For the 18 and over model we examined overall frequencies and proportions of the admissions excluded for each exclusion criterion in all pneumonia admissions in 2006 all-payer California data (initial cohort included 69,247 admissions). The exclusion categories are not mutually exclusive.

1. Same or next day discharge, and patient did not die, transfer, or leave against medical advice (6.72%)
2. Transfers into the hospital (3.68%)
3. Inconsistent or unknown vital status (0.00%)
4. Discharges against medical advice (AMA) (1.25%)
5. Unreliable data (0.00%)
6. Excluded based on random selection of one hospitalization per patient per year (8.39%)

2b4. Risk Adjustment Strategy. (*For outcome measures, adjustment for differences in case mix (severity) across measured entities was appropriately tested with adequate results.*)

2b4.1 Data/Sample *(Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included)*:
Measure Development and Validation:
During initial measure development, using Medicare FFS beneficiaries age 65 and over, we tested the performance of the model developed in a random selected half of the hospitalizations for pneumonia in data from the year 2000 (representing 224,608 cases discharged from 4,664 hospitals) against hospitalizations from the other half (representing 224,688 cases discharged from 4683 hospitals)

Assessment of Temporal Trends in Model Performance Across Years of Data
For the 2007-2009 calendar year dataset, we reported results for each individual year as well as the 3-year combined results.

Application to Medicare FFS Beneficiaries Using Inpatient Data Only for Risk Adjustment
As part of testing the model in all-payer data, we also applied the model to CMS data for Medicare FFS 65+ patients in California hospitals using only inpatient data for risk adjustment. Specifically, we created a 2006 measure cohort with complete one-year history data and 30-day follow-up data (N= 27,566).

Application to Patients Aged 18 and Older
We also applied the model to all-payer data from California. The analytic sample included 69,247cases aged 18 and older in the 2006 California Patient Discharge Data. When used in all-payer data, only admission claims data are used for risk adjustment, as the hospital discharge databases do not have outpatient claims.

2b4.2 Analytic Method (*Describe methods and rationale for development and testing of risk model or risk stratification including selection of factors/variables)*:
Measure Development and Validation
This measure is fully risk-adjusted using a hierarchical logistic regression model to calculate hospital RSMRs accounting for differences in hospital case-mix. (See section 2a1.13. "Statistical risk model and variables" for additional details.)

Approach to assessing model performance
During measure development, we computed five summary statistics for assessing model performance (Harrell and Shih 2001) for the development and validation cohort:

(1) over-fitting indices (over-fitting refers to the phenomenon in which a model accurately describes the relationship between predictive variables and outcome in the development dataset but fails to provide valid predictions in new patients)

(2) predictive ability

(3) area under the receiver operating characteristic (ROC) curve

(4) distribution of residuals

(5) model chi-square (A test of statistical significance usually employed for categorical data to determine whether there is a good fit between the observed data and expected values; i.e., whether the differences between observed and expected values are attributable to true differences in characteristics or instead the result of chance variation).

Assessment of Temporal Trends in Model Performance Across Years of Data
Across years, we examined consistency in frequency of risk-adjustment variables and parameter estimates for risk-adjustment variables and model performance (C statistic).

Application to Medicare FFS Beneficiaries Using Inpatient Data Only for Risk Adjustment
To help determine whether the measure could be applied to Medicare FFS 65+ patients using only Medicare Part A data, we performed analyses to assess how the model performs when using only inpatient claims data for risk adjustment, as all-payer hospital discharge databases do not have outpatient claims. To assess the validity of using only admission claims data for risk adjustment, we 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 (scatter plot, correlation coefficient, and R2) to assess whether the model with only admission claims data is different from the current model in profiling hospital rates.

Application to Patients Aged 18 and Older
To help determine whether the measure could be applied to a population of patients aged 18+, we examined the interaction terms between age (18-64 vs. 65+) and each of the other risk factors. Specifically, we 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 (scatter plot, correlation coefficient, and R-square) to assess whether the model with interactions is different from the current model in profiling hospital rates.

Reference:
Harrell FE, Shih YCT. Using full probability models to compute probabilities of actual interest to decision makers. Int J Technol Assess Health Care. 2001;17:17–26.

2b4.3 Testing Results *(Statistical risk model: Provide quantitative assessment of relative contribution of model risk factors; risk model performance metrics including cross-validation discrimination and calibration statistics, calibration curve and risk decile plot, and assessment of adequacy in the context of norms for risk models. Risk stratification: Provide quantitative assessment of relationship of risk factors to the outcome and differences in outcomes among the strata)*:
Measure Development and Validation
The performance was not substantively different in the validation sample (ROC area = 0.72) compared with the development sample (2000). The models appear well calibrated, with over-fitting indices of (0.0018, 0.9994).

For the development cohort, model performance results are summarized below:
Model Chi-square [# of covariates]: 15714 [31]
Predictive ability (lowest decile %, highest decile %): 2.7%-35.6%
Area under ROC curve: 0.72

For the validation cohort the results are summarized below:
Model Chi-square [# of covariates]: 15747 [31]
Predictive ability (lowest decile %, highest decile %): 2.7%-35.4%
Area under ROC curve: 0.72

Assessment of Temporal Trends in Model Performance Across Years of Data
The frequency of risk-adjustment variables and parameter estimates for risk-adjustment variables and model performance was stable over all time periods.

Model Performance in Medicare FFS Beneficiaries Using Inpatient Data Only for Risk Adjustment using CMS data for Medicare FFS 65+ beneficiaries in California hospitals: (a) the magnitude of odds ratios for most risk factors was similar when comparing the model using full data and using only admission claims data; (b) when comparing the model with full data and with only admission claims data, the reclassification analysis demonstrated good patient-level risk prediction; (c) the c-statistic was similar (0.713 vs. 0.719); and (d) hospital-level risk-standardized rates were highly correlated (ICC=0.989).

Model Performance in Patients Aged 18 and Older
When the model was applied to all patients 18 and over (18+), overall discrimination was good (c-statistic=0.759). In addition, there was good discrimination and predictive ability in both those aged 18-64 and those aged 65+. Moreover, the distribution of Pearson residuals was comparable across the patient subgroups. When comparing the model with and without interaction terms, (a) the reclassification analysis demonstrated that nearly all patients were found to be in a similar risk category; (b) the c-statistic was identical (0.759 vs. 0.759); and (c) hospital-level risk-standardized rates were highly correlated (ICC=0.999). Thus, the inclusion of the interactions did not substantively affect either patient-level model performance or hospital-level results.

Therefore, the measure can be applied to all payer data for patients 18 and older.

References:
Krumholz HM, Normand S-LT, Galusha DH, Mattera JA, Rich AS, Wang YF, Wang Y. et al. Risk-Adjustment Models for AMI and HF: 30-Day Mortality: Report prepared for the Centers for Medicare & Medicaid Services; 2005. Available at: http://www.qualitynet.org/

Bernheim SM, et al. 2010 Measures Maintenance Technical Report: Acute Myocardial Infarction, Heart Failure and Pneumonia 30-day Risk Standardized Mortality Rate. 2010 Available at: http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic/Page/QnetTier3&cid=1163010421830

2b4.4 If outcome or resource use measure is not risk adjusted, provide rationale and analyses to justify lack of adjustment: N/A

2b5. Identification of Meaningful Differences in Performance. (*The performance measure scores were appropriately analyzed and discriminated meaningful differences in quality.*)

2b5.1 Data/Sample *(Describe the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included)*:
The data are based on RSMRs calculated for pneumonia hospitalizations among Medicare FFS patients aged 65+ from January 1, 2007- December 31, 2009 and includes 1,129,091 hospitalizations from 4,907 hospitals.

2b5.2 Analytic Method *(Describe methods and rationale to identify statistically significant and practically/meaningfully differences in performance)*:
Below we present the distribution of the current measure.

For public reporting of the measure, CMS characterizes the uncertainty associated with the RSMR by estimating the 95% interval estimate. This is similar to a 95% confidence interval but is calculated differently. If the RSMR's interval estimate does not include the national crude mortality rate (is lower or higher than the rate), then CMS is confident that the hospital's RSMR is different from the national rate, and describes the hospital on the Hospital compare website as "better than the U.S. national rate" or "worse than the U.S. national rate." If the interval includes the national rate, then CMS describes the hospital's RSMR as "no different than the U.S. national rate" or "the difference is uncertain." CMS does not classify performance for hospitals that have fewer than 25 pneumonia cases in the three-year period.

2b5.3 Results *(Provide measure performance results/scores, e.g., distribution by quartile, mean, median, SD, etc.; identification of statistically significant and meaningfully differences in performance)*:
Recent analyses of Medicare FFS data show substantial variation in pneumonia RSMRs among hospitals. For data from (1/2007-12/2009) the mean hospital RSMR was 11.7% with a range of 6.9% to 20.4%. The 5th percentile was 8.8% and the 95th percentile was 15.0%. The interquartile range was 10.4% to 12.8%.

2b6. Comparability of Multiple Data Sources/Methods. (*If specified for more than one data source, the various approaches result in comparable scores.*)

2b6.1 Data/Sample *(Describe the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included)*:
The measure performs well in both Medicare FFS data and all-payer data.

2b6.2 Analytic Method *(Describe methods and rationale for testing comparability of scores produced by the different data sources specified in the measure)*:
See attached all-payer report in 2.1

2b6.3 Testing Results *(Provide statistical results, e.g., correlation statistics, comparison of rankings; assessment of adequacy in the context of norms for the test conducted)*:
See attached all-payer report in 2.1

2c. Disparities in Care: H☐ M☐ L☐ I ☐ NA☐ (*If applicable, the measure specifications allow identification of disparities.*)

2c.1 If measure is stratified for disparities, provide stratified results *(Scores by stratified categories/cohorts)*: Measure is not stratified for disparities.

2c.2 If disparities have been reported/identified (e.g., in 1b), but measure is not specified to detect disparities, please explain:
The analyses performed by CMS (described in section 1b) demonstrate that hospitals have similar and overlapping performance on the measure regardless of the proportion of patients of low socioeconomic status or of African-American race. Importantly, the analyses show that hospitals with high proportions of low socioeconomic status patients or high proportions of African-American patients are able to perform well on the measure. For this reason CMS does not plan to stratify the measure.

2.1-2.3 Supplemental Testing Methodology Information:

Attachment
All-Payer Testing Report_AMI_HF_PN_Measures_Final [1.17.12].pdf

Steering Committee: Overall, was the criterion, *Scientific Acceptability of Measure Properties*, met?
(*Reliability and Validity must be rated moderate or high*) Yes☐ No☐
Provide rationale based on specific subcriteria:

If the Committee votes No, STOP

3. USABILITY

Extent to which intended audiences (e.g., consumers, purchasers, providers, policy makers) can understand the results of the measure and are likely to find them useful for decision making. (evaluation criteria)

C.1 Intended Purpose/ Use *(Check all the purposes and/or uses for which the measure is intended)*: Public Reporting, Quality Improvement with Benchmarking (external benchmarking to multiple organizations)

3.1 Current Use *(Check all that apply; for any that are checked, provide the specific program information in the following questions)*: Public Reporting, Quality Improvement with Benchmarking (external benchmarking to multiple organizations)

3a. Usefulness for Public Reporting: H☐ M☐ L☐ I ☐
(*The measure is meaningful, understandable and useful for public reporting.*)

3a.1. Use in Public Reporting - disclosure of performance results to the public at large *(If used in a public reporting program, provide name of program(s), locations, Web page URL(s)).* If not publicly reported in a national or community program, state the reason AND plans to achieve public reporting, potential reporting programs or commitments, and timeline, e.g., within 3 years of endorsement: [*For Maintenance – If not publicly reported, describe progress made toward achieving disclosure of performance results to the public at large and expected date for public reporting; provide rationale why continued endorsement should be considered.*]
The measure has been publicly reported on Hospital Compare (www.hospitalcompare.hhs.gov) since June 2008 and is used in CMS' Hospital Inpatient Quality Reporting Program (Formerly RHQDAPU).

3a.2.Provide a rationale for why the measure performance results are meaningful, understandable, and useful for public reporting. If usefulness was demonstrated (e.g., focus group, cognitive testing), describe the data, method, and results: The measure has been systematically evaluated by a group of clinical experts throughout the development process to construct a measure for use in public reporting. We have received input and feedback on key issues related to the meaningfulness, usefulness, and design of the measure. Meetings were held throughout the development process and we received input and feedback on key methodological and clinical decisions to ensure the measure is meaningful and useful.

Prior to being publicly reported, the measure underwent a dry run in July 2007 where hospitals received their results for review. The primary goal of the dry run was to reach out to and educate hospitals about the pneumonia measure and to test the measure production process. CMS asked hospitals to review and comment on the draft reports and methodology. CMS also worked with hospitals to help them understand the measure methodology and their own data. Feedback from the dry run resulted in the hospice exclusion.

In addition, similar measures for acute myocardial infarction (AMI) and heart failure underwent consumer testing prior to being publicly reported and were found to be useful for publicly reporting outcomes.

3.2 Use for other Accountability Functions (payment, certification, accreditation). If used in a public accountability program, provide name of program(s), locations, Web page URL(s): The measure has been publicly reported on Hospital Compare (www.hospitalcompare.hhs.gov) since June 2008 and is used in CMS' Hospital Inpatient Quality Reporting Program (Formerly RHQDAPU).

3b. Usefulness for Quality Improvement: H☐ M☐ L☐ I ☐
(*The measure is meaningful, understandable and useful for quality improvement.*)

3b.1. Use in QI. If used in quality improvement program, provide name of program(s), locations, Web page URL(s):
[*For Maintenance – If not used for QI, indicate the reasons and describe progress toward using performance results for improvement*].
The measure has been publicly reported on Hospital Compare (www.hospitalcompare.hhs.gov) since June 2008 and is used in CMS' Hospital Inpatient Quality Reporting Program (Formerly RHQDAPU).

3b.2. Provide rationale for why the measure performance results are meaningful, understandable, and useful for quality improvement. If usefulness was demonstrated *(e.g., QI initiative),* describe the data, method and results:
A hospital-level, 30-day mortality measure for pneumonia patients may incentivize hospitals to improve quality of care for this high-risk population.

Overall, to what extent was the criterion, *Usability*, met? H☐ M☐ L☐ I ☐
Provide rationale based on specific subcriteria:

4. FEASIBILITY

Extent to which the required data are readily available, retrievable without undue burden, and can be implemented for performance measurement. (evaluation criteria)

4a. Data Generated as a Byproduct of Care Processes: H☐ M☐ L☐ I ☐

4a.1-2 How are the data elements needed to compute measure scores generated? *(Check all that apply).*
Data used in the measure are:
Coded by someone other than person obtaining original information (e.g., DRG, ICD-9 codes on claims)

4b. Electronic Sources: H☐ M☐ L☐ I ☐

4b.1 Are the data elements needed for the measure as specified available electronically *(Elements that are needed to compute measure scores are in defined, computer-readable fields)*: ALL data elements in electronic claims

4b.2 If ALL data elements are not from electronic sources, specify a credible, near-term path to electronic capture, OR provide a rationale for using other than electronic sources:

4c. Susceptibility to Inaccuracies, Errors, or Unintended Consequences: H☐ M☐ L☐ I ☐

4c.1 Identify susceptibility to inaccuracies, errors, or unintended consequences of the measurement identified during testing and/or operational use and strategies to prevent, minimize, or detect. If audited, provide results:
This measure uses variables from claims data submitted by hospitals for payment. Prior research has demonstrated that administrative claims data can be used to develop risk-adjusted outcomes measures for both mortality and readmission following hospitalization for acute myocardial infarction (Krumholz et al., 2006a; Krumholz et al., 2011), heart failure (Krumholz et al., 2006b; Keenan et al., 2008), and pneumonia (Bratzler et al., 2011; Lindenauer et al., 2011), and that the models produce estimates of risk-standardized rates that are very similar to rates estimated by models based on medical record data. This high level of agreement supports the use of the claims-based risk-adjusted models for public reporting. The models have also demonstrated consistent performance across years of claims data.

The approach to gathering risk factors for patients also mitigates the potential limitations of claims data. Because not every diagnosis is coded at every visit, we use inpatient, outpatient, and physician claims data for the year prior to admission, and diagnosis codes during the index admission, for risk adjustment when the measure is used in Medicare FFS data. When the measure is used in all-payer data, only admission claims data (from the index hospitalization and prior year) are used for risk adjustment; however, model testing demonstrated both strong patient-level model performance and consistent hospital-level results when using only admission claims data. The 1-year time frame provides a more comprehensive view of patients' medical histories than is provided by the secondary diagnosis codes from the index hospitalization alone. If a diagnosis appears in some visits and not others, it is included, minimizing the effect of incomplete coding. We were careful, however, to include information about each patient's status at admission and not to adjust for possible complications of the admission. Although some codes, by definition, represent conditions that are present before admission (e.g. cancer), other codes and conditions cannot be differentiated from complications during the hospitalization (e.g. infection or shock). If these are secondary diagnoses from the index admission, then

they are not adjusted for in the analysis.

References:
Krumholz HM, Wang Y, Mattera JA, Wang Y-F, Han LF, Ingber MJ, Roman S, Normand SL (2006a). 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.

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. Circulation: Cardiovascular Quality and Outcomes. 2011 Mar 1;4(2):243-52.

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Keenan PS, Normand SL, Lin Z, Drye EE, Bhat KR, Ross JS, Schuur JD, Stauffer BD, Bernheim SM, Epstein AJ, Wang Y-F, 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. Circulation: Cardiovascular Quality and Outcomes. 2008 Sep;1(1):29-37.

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4d. Data Collection Strategy/Implementation: H☐ M☐ L☐ I ☐

A.2 Please check if either of the following apply (*regarding proprietary measures*):
4d.1 Describe what you have learned/modified as a result of testing and/or operational use of the measure regarding data collection, availability of data, missing data, timing and frequency of data collection, sampling, patient confidentiality, time and cost of data collection, other feasibility/implementation issues *(e.g., fees for use of proprietary measures)*:
Administrative data is routinely collected as part of the billing process.

Overall, to what extent was the criterion, *Feasibility*, met? H☐ M☐ L☐ I ☐
Provide rationale based on specific subcriteria:

OVERALL SUITABILITY FOR ENDORSEMENT

Does the measure meet all the NQF criteria for endorsement? Yes☐ No☐
Rationale:

If the Committee votes No, STOP.
If the Committee votes Yes, the final recommendation is contingent on comparison to related and competing measures.

5. COMPARISON TO RELATED AND COMPETING MEASURES

If a measure meets the above criteria and there are endorsed or new related measures (either the same measure focus or the same target population) or competing measures (both the same measure focus and the same target population), the measures are compared to address harmonization and/or selection of the best measure before a final recommendation is made.

5.1 If there are related measures *(either same measure focus or target population)* or competing measures *(both the same measure focus and same target population*), list the NQF # and title of all related and/or competing measures:
0229 : Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following heart failure (HF) hospitalization for patients 18 and older

0230 : Hospital 30-day, all-cause, risk-standardized mortality rate (RSMR) following acute myocardial infarction (AMI) hospitalization for patients 18 and older
0231 : Pneumonia Mortality Rate (IQI #20)
0506 : Hospital 30-day, all-cause, risk-standardized readmission rate (RSRR) following pneumonia hospitalization
0708 : Proportion of Patients Hospitalized with Pneumonia that have a Potentially Avoidable Complication (during the Index Stay or in the 30-day Post-Discharge Period)

5a. Harmonization

5a.1 If this measure has EITHER the same measure focus OR the same target population as NQF-endorsed measure(s): Are the measure specifications completely harmonized? Yes

5a.2 If the measure specifications are not completely harmonized, identify the differences, rationale, and impact on interpretability and data collection burden:

5b. Competing Measure(s)

5b.1 If this measure has both the same measure focus and the same target population as NQF-endorsed measure(s): Describe why this measure is superior to competing measures *(e.g., a more valid or efficient way to measure quality);* OR provide a rationale for the additive value of endorsing an additional measure. *(Provide analyses when possible)*:

CONTACT INFORMATION

Co.1 Measure Steward (Intellectual Property Owner): Centers for Medicare & Medicaid Services, 7500 Security Boulevard , Mail Stop S3-01-02, Baltimore, Maryland, 21244-1850

Co.2 Point of Contact: Lein, Han, Ph.D., Government Task Leader, Lein.han@cms.hhs.gov, 410-786-0205-

Co.3 Measure Developer if different from Measure Steward: Yale New Haven Health Services Corporation/Center for Outcomes Research and Evaluation (YNHHSC/CORE), 1 Church Street, 2nd Floor, Suite #200, New Haven, Connecticut, 06510

Co.4 Point of Contact: Susannah, Bernheim, MD, MHS, susannah.bernheim@yale.edu, 203-815-3330-

Co.5 Submitter: Susannah, Bernheim, MD, MHS, susannah.bernheim@yale.edu, 203-815-3330-, Yale New Haven Health Services Corporation/Center for Outcomes Research and Evaluation (YNHHSC/CORE)

Co.6 Additional organizations that sponsored/participated in measure development:
MPR: Mathematica Policy Research; RTI-Research Triangle Institute

Co.7 Public Contact: Lein, Han, Ph.D., Government Task Leader, Lein.han@cms.hhs.gov, 410-786-0205-, Centers for Medicare & Medicaid Services

ADDITIONAL INFORMATION

Workgroup/Expert Panel involved in measure development
Ad.1 Provide a list of sponsoring organizations and workgroup/panel members' names and organizations. Describe the members' role in measure development.
The working group involved in the initial measure development is detailed in the original technical report available at www.qualitynet.org

Ad.2 If adapted, provide title of original measure, NQF # if endorsed, and measure steward. Briefly describe the reasons for adapting the original measure and any work with the original measure steward:

Measure Developer/Steward Updates and Ongoing Maintenance
Ad.3 Year the measure was first released: 2008
Ad.4 Month and Year of most recent revision: 08, 2011

Ad.5 What is your frequency for review/update of this measure? Yearly Ad.6 When is the next scheduled review/update for this measure? 07, 2012
Ad.7 Copyright statement:
Ad.8 Disclaimers:
Ad.9 Additional Information/Comments: www.qualitynet.org for Measure Methodology report and Maintenance reports
Date of Submission (*MM/DD/YY*): 10/18/2011

Pneumonia Cohort ICD-9 Codes Mapped to ICD-10 Codes

Pneumonia ICD-9 Diagnosis Code	ICD-9 Diagnosis Code Description	ICD-10 Diagnosis Code	ICD-10 Diagnosis Code Description	Flag
4800	Pneumonia due to adenovirus	J120	Adenoviral pneumonia	00000
4801	Pneumonia due to respiratory syncytial virus	J121	Respiratory syncytial virus pneumonia	00000
4802	Pneumonia due to parainfluenza virus	J122	Parainfluenza virus pneumonia	00000
4803	Pneumonia due to SARS-associated coronavirus	J1281	Pneumonia due to SARS-associated coronavirus	00000
4808	Pneumonia due to other virus not elsewhere classified	J1289	Other viral pneumonia	10000
4809	Viral pneumonia, unspecified	J129	Viral pneumonia, unspecified	10000
481	Pneumococcal pneumonia [Streptococcus pneumoniae pneumonia]	J13	Pneumonia due to Streptococcus pneumoniae	10000
		J181	Lobar pneumonia, unspecified organism	10000
4820	Pneumonia due to Klebsiella pneumoniae	J150	Pneumonia due to Klebsiella pneumoniae	00000
4821	Pneumonia due to Pseudomonas	J151	Pneumonia due to Pseudomonas	00000
4822	Pneumonia due to Hemophilus influenzae [H. influenzae]	J14	Pneumonia due to Hemophilus influenzae	00000
48230	Pneumonia due to Streptococcus, unspecified	J154	Pneumonia due to other streptococci	10000
48231	Pneumonia due to Streptococcus, group A	J154	Pneumonia due to other streptococci	10000
48232	Pneumonia due to Streptococcus, group B	J153	Pneumonia due to streptococcus, group B	00000
48239	Pneumonia due to other Streptococcus	J154	Pneumonia due to other streptococci	10000
48240	Pneumonia due to Staphylococcus, unspecified	J1520	Pneumonia due to staphylococcus, unspecified	00000
48241	Methicillin susceptible pneumonia due to Staphylococcus aureus	J1521	Pneumonia due to staphylococcus aureus	10000
48242	Methicillin resistant pneumonia due to Staphylococcus aureus	J1521	Pneumonia due to staphylococcus aureus	10111
		Z16	Infection with drug resistant microorganisms	10112
48249	Other Staphylococcus pneumonia	J1529	Pneumonia due to other staphylococcus	00000
48281	Pneumonia due to anaerobes	J158	Pneumonia due to other specified bacteria	10000
48282	Pneumonia due to escherichia coli [E. coli]	J155	Pneumonia due to Escherichia coli	00000
48283	Pneumonia due to other gram-negative bacteria	J156	Pneumonia due to other aerobic Gram-negative bacteria	00000
48284	Pneumonia due to Legionnaires' disease	A481	Legionnaires' disease	00000
48289	Pneumonia due to other specified bacteria	J158	Pneumonia due to other specified bacteria	10000
4829	Bacterial pneumonia, unspecified	J159	Unspecified bacterial pneumonia	00000
4830	Pneumonia due to mycoplasma pneumoniae	J157	Pneumonia due to Mycoplasma pneumoniae	00000
4831	Pneumonia due to chlamydia	J160	Chlamydial pneumonia	00000
4838	Pneumonia due to other specified organism	J168	Pneumonia due to other specified infectious organisms	00000
485	Bronchopneumonia, organism unspecified	J180	Bronchopneumonia, unspecified organism	00000
486	Pneumonia, organism unspecified	J189	Pneumonia, unspecified organism	10000
4870	Influenza with pneumonia	J1100	Influenza due to unidentified influenza virus with unspecified type of pneumonia	10000
		J129	Viral pneumonia, unspecified	10000
48811		J09119	Influenza due to identified novel H1N1 influenza virus with unspecified type of pneumonia	10000

Testing Publicly Reported 30-Day Acute Myocardial Infarction, Heart Failure, and Pneumonia Risk-Standardized Mortality and Readmission Measures in California All-Payer Data

Submitted By Yale New Haven Health Services Corporation/Center for Outcomes Research & Evaluation (YNHHSC/CORE):

Contract # HHSM-500-2008-00025I/HHSM-500-T0001, Modification No. 000005

Prepared For:

Centers for Medicare & Medicaid Services (CMS)

Submitted September 27, 2011

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Introduction

The Centers for Medicare & Medicaid Services (CMS) publicly reports six National Quality Forum (NQF)-endorsed 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 and older. The measures are currently undergoing, or will soon be scheduled to undergo, NQF endorsement maintenance. As part of the NQF endorsement maintenance process the measure developer, Yale New Haven Health Services Corporation/Center for Outcomes Research and Evaluation (YNHHSC/CORE), has assessed 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 prior to 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). Hospital-specific mortality and readmission measure results are posted on the *Hospital Compare* Web site (http://www.hospitalcompare.hhs.gov).

The results of the present analysis support expanding the mortality and readmission measures' patient population to include both non-FFS Medicare patients aged 65+ years and all-payer patients aged 18-64 years. Based on the results presented below, we conclude that CMS' publicly reported measures – RSMRs and RSRRs for AMI, HF, and pneumonia – perform well when applied to all-payer data (all patients aged 18+ years). For each measure, 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 non-Federal acute care 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 aged 65+ but also non-FFS Medicare patients aged 65+ and younger patients aged 18-64 years at the time of admission. The CMS models use inpatient and outpatient data for risk adjustment and were validated against medical record-based models in a cohort of patients aged 65+ years.[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)? That is, does the exclusion of outpatient claims data adversely affect measure performance and results at the patient level and at the hospital level?

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, do the models, when derived in the full 18+ population, have good discrimination, predictive ability, and model fit across patient subgroups? 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 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 six measures, 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 CMS model specifications vs. using only admission claims data (history and current).
B. Fit the model separately using all patient history data and using only admission claims data and: (i) compared the odds ratios (ORs) for the various risk factors produced using the two different risk-adjustment datasets –the dataset using all CMS measure data sources and the admission claims only dataset; (ii) determined the value of the outpatient history information using reclassification analysis to determine the number of patients reclassified and the calibration of the predictions at the patient level; (iii) compared model performance in terms of the c-statistic (discrimination) using the two different risk-adjustment datasets; and (iv) compared hospital-level risk-standardized rates (scatterplot and intra-class correlation coefficient [ICC]) to quantify the relationship and reliability of models with and without outpatient claims history data.

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 six measures, we:

A. Created the patient cohort using the CMS measure inclusion and exclusion criteria (with the exceptions of including all patients 18+ and dropping the hospice exclusion for the mortality measures), 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: (i) examined overall model performance in terms of the c-statistic; (ii) compared performance (c-statistic, predictive ability) across the patient subgroups (FFS 65+, non-FFS 65+, all 65+, and all-payer 18-64); and (iii) 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 among the subgroups.

To determine whether the relationship between each risk factor and the outcome differed for those aged 65+ vs. 18-64 in ways that would affect measure results, we:

A. Fit the model in all patients 18+ and tested interaction terms between age (65+ vs. 18-64) and each of the other risk factors.
B. Fit the model in all patients 18+ with interaction terms and compared performance (c-statistic, predictive ability) across the patient subgroups.
C. Fit the model in all patients 18+ with and without interaction terms and (i) conducted a reclassification analysis to compare risk prediction at the patient level; (ii) compared the c-statistic; and (iii) compared hospital-level risk-standardized rates (scatterplot and ICC) to assess whether the model with interactions is statistically different from the current model in profiling hospital rates.

All patient-level models were estimated using a logistic regression model; next, hospital-level RSMR and RSRR analyses were conducted using a hierarchical logistic regression model approach.

Results

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

A. The numbers of patients in the AMI, HF, and pneumonia mortality and AMI, HF, and pneumonia readmission cohorts are presented in Figure 1 a-1 f, respectively. For all six measures, the prevalence of most risk factors was lower when using only admission claims data (Table 1 a-1 f).

B. However, the magnitude of effect for most risk factors was similar when comparing the model using all patient history data and using only admission claims data (Table 2 a-2 f). 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 six measures, over 95% of patients were in a similar risk category (defined as being in the same or adjacent category) regardless of risk-adjustment dataset, and the integrated discrimination improvement (IDI) values were relatively low (Table 3 a-3 f). For all six measures, the c-statistic was also qualitatively similar between the two approaches (0.713 vs. 0.725 for AMI mortality; 0.681 vs. 0.684 for HF mortality; 0.713 vs. 0.719 for pneumonia mortality; 0.619 vs. 0.614 for AMI readmission; 0.610 vs. 0.611 for HF readmission; and 0.632 vs. 0.628 for pneumonia readmission) (Table 4 a-4 f). Moreover, when comparing the model with full data and with only admission claims data, hospital-level risk-standardized rates were highly correlated (ICC=0.984 for AMI mortality; ICC=0.993 for HF mortality; ICC=0.989 for pneumonia mortality; ICC=0.950 for AMI readmission; ICC=0.978 for HF readmission; and ICC=0.985 for pneumonia readmission) (Figure 2 a-2 f).

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

A. The AMI, HF, and pneumonia mortality and AMI, HF, and pneumonia readmission cohorts are presented in Figure 3 a-3 f, respectively. As the results in Table 5 a-5 f show, for each measure, there are some differences in the risk factor profile and crude outcome rate among patient subgroups. For example, across all six measures, patients aged 18-64 years were significantly more likely than patients aged 65+ years to be men. For AMI mortality (Table 5 a) and AMI readmission (Table 5 d), 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 and pneumonia mortality (Table 5 b and Table 5 c) and HF and pneumonia readmission (Table 5 e and Table 5 f), 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 measures, though, prevalence estimates for many HF and pneumonia mortality and HF and pneumonia readmission risk factors were more similar between younger and older patients; in fact, prevalence estimates were often higher in younger than older patients for some conditions, including diabetes and its complications, psychiatric and substance use disorders, and liver and biliary disease. Finally, unlike for the three mortality measures and AMI readmission, the crude outcome rates for HF readmission (Table 5 e) and for pneumonia readmission (Table 5 f) were more similar in younger and older patients.

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, 0.759

for pneumonia mortality, 0.670 for AMI readmission, 0.638 for HF readmission, and 0.666 for pneumonia readmission) (Table 6 a-6 f). There was also good discrimination and predictive ability in all subgroups of patients (Table 7 a-7 f). For the three readmission measures, predictive ability was observed to be greater in newly added younger patients aged 18-64 years than those aged 65+ years; in addition, the c-statistic was significantly higher in younger patients than in older patients (Table 7 d-7 f). For the HF mortality measure, the c-statistic was lower and the predictive range was narrower among those 18-64, albeit still reasonable given the group's lower mortality rate, compared with those 65+ (Table 7 b). Moreover, for all six measures, the distribution of Pearson residuals was comparable across the patient subgroups (Table 8 a-8 f).

C. For all six 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 (Table 9 a-9 f).

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

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

F. In addition, when comparing each measure with and without interaction terms, the reclassification analysis demonstrated good patient-level risk prediction across measures: for all measures and all patient subgroups, nearly 100% of patients were in a similar risk category (defined as being in the same or adjacent category) regardless of risk-adjustment strategy, and the IDI values were relatively small in magnitude (Table 12 a-12 f). Moreover, the c-statistic was nearly identical with and without interaction terms (0.767 vs. 0.765 for AMI mortality; 0.720 vs. 0.718 for HF mortality; 0.759 vs. 0.759 for pneumonia mortality; 0.673 vs. 0.670 for AMI readmission; 0.640 vs. 0.638 for HF readmission; and 0.669 vs. 0.666 for pneumonia readmission) (Table 13 a-13 f). Finally, when comparing each measure with and without interaction terms, the hospital-level risk-standardized rates estimated by the two models were highly correlated (ICC=0.998 for AMI mortality; ICC=1.000 for HF mortality; ICC=0.999 for pneumonia mortality; ICC=0.998 for AMI readmission; ICC=0.996 for HF readmission; and ICC=0.997 for pneumonia readmission) (Figure 4 a-4 f).

Conclusions

Based on the results presented above, we conclude that CMS' publicly reported measures perform well when applied to all-payer data (all patients aged 18+ years). 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+ years 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+ 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 dataset has some limitations. Data on previous admissions and 30-day readmissions are available only from California hospitals; however, it is unlikely that many patients sought hospital inpatient care outside the state given that relatively few California residents live in cities bordering other U.S. states. Likewise, linked data on 30-day mortality outside the hospital are available only for deaths in California. Moreover, although we were able to test how the measures perform without the use of outpatient data for risk adjustment in the FFS Medicare 65+ population, we were not able to do the same for non-FFS Medicare 65+ patients and younger patients aged 18-64 years given the lack of outpatient claims in the all-payer hospital discharge database. However, had the testing been possible, it is unlikely to have altered the conclusions. First, all other testing demonstrated comparability between FFS Medicare and non-FFS Medicare patients aged 65+ years. Second, given generally lower rates of health care utilization in younger adults, lack of outpatient claims for those aged 18-64 years would be less likely to have substantively affected their subgroup results than for those aged 65+ years.

In summary, CMS' publicly reported measures – hospital 30-day RSMRs and RSRRs for AMI, HF, and pneumonia – perform well when used in all-payer data (all patients aged 18+ years). For each measure, model testing demonstrated both strong patient-level model performance and consistent hospital-level results.

References

1. Krumholz HM, Wang Y, Mattera JA, Wang Y-F, 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. Circulation: Cardiovascular Quality and Outcomes. 2011 Mar 1;4(2):243-52.
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4. Keenan PS, Normand SL, Lin Z, Drye EE, Bhat KR, Ross JS, Schuur JD, Stauffer BD, Bernheim SM, Epstein AJ, Wang Y-F, 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. Circulation: Cardiovascular Quality and 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. Public Library of Science One. 2011 Apr 12;6(4):e17401.
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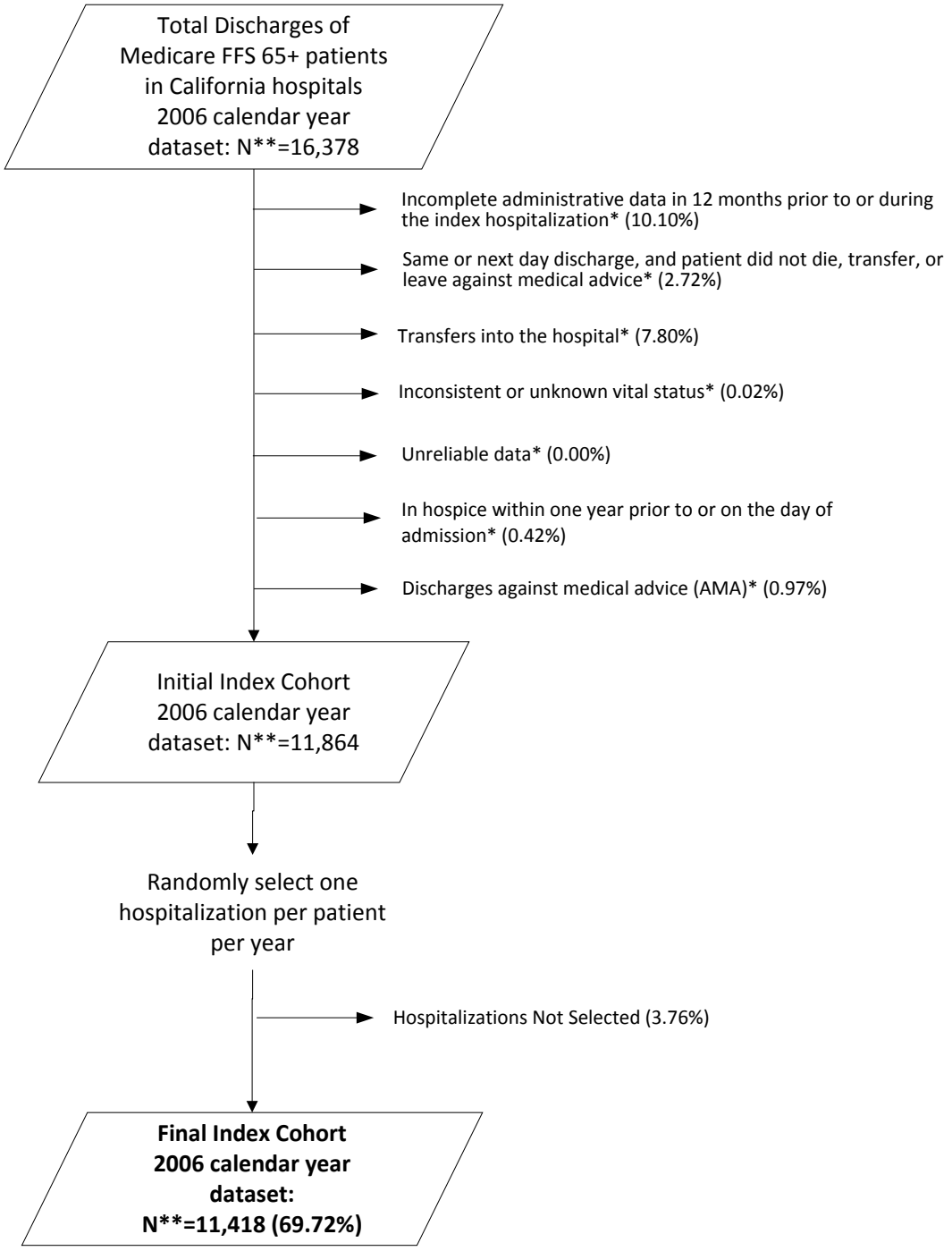
Figures and Tables

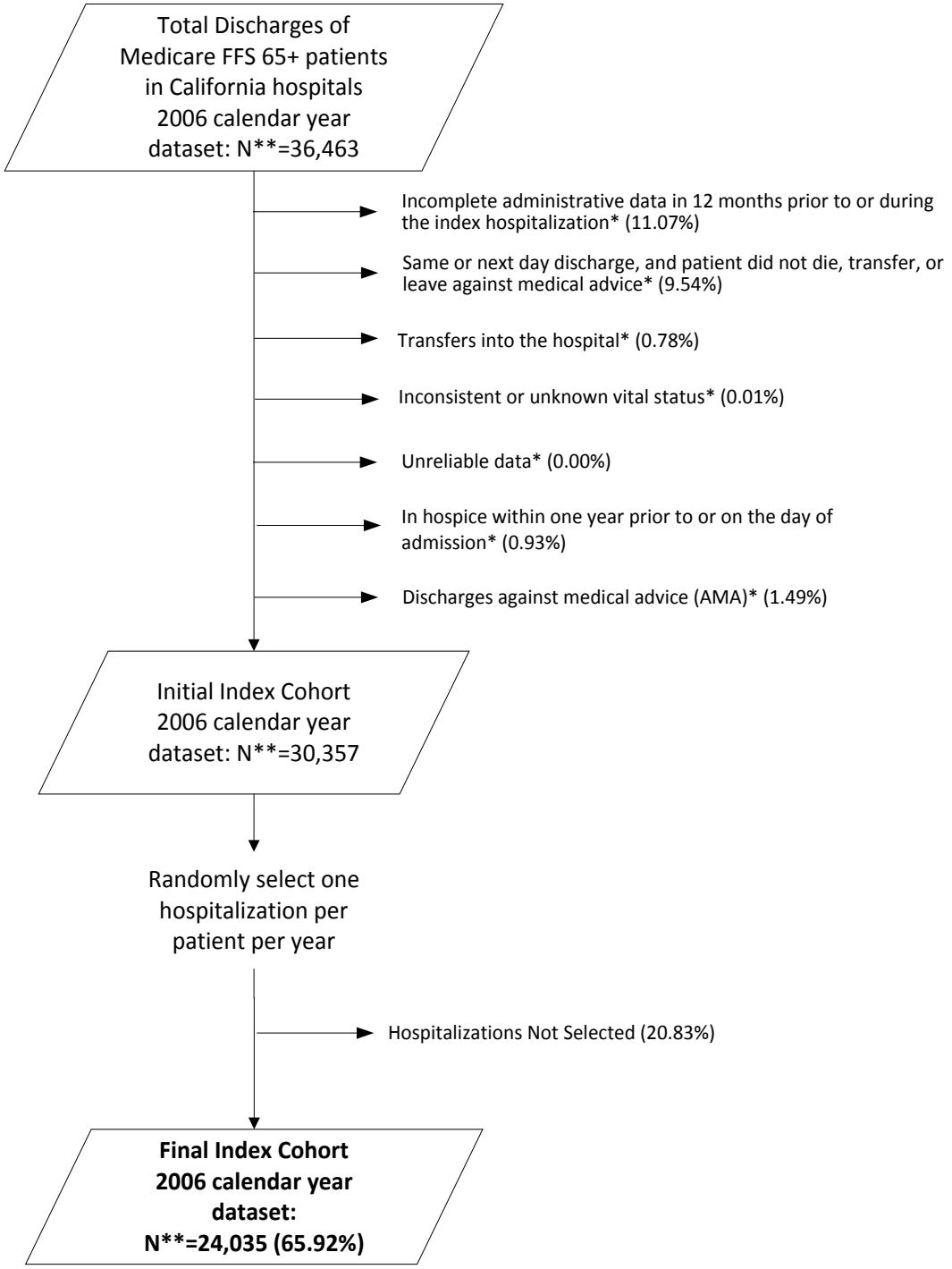
Figure 1 a. 2006 AMI Mortality Cohort Using CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals



*Categories are not mutually exclusive

**N refers to the number of discharges.

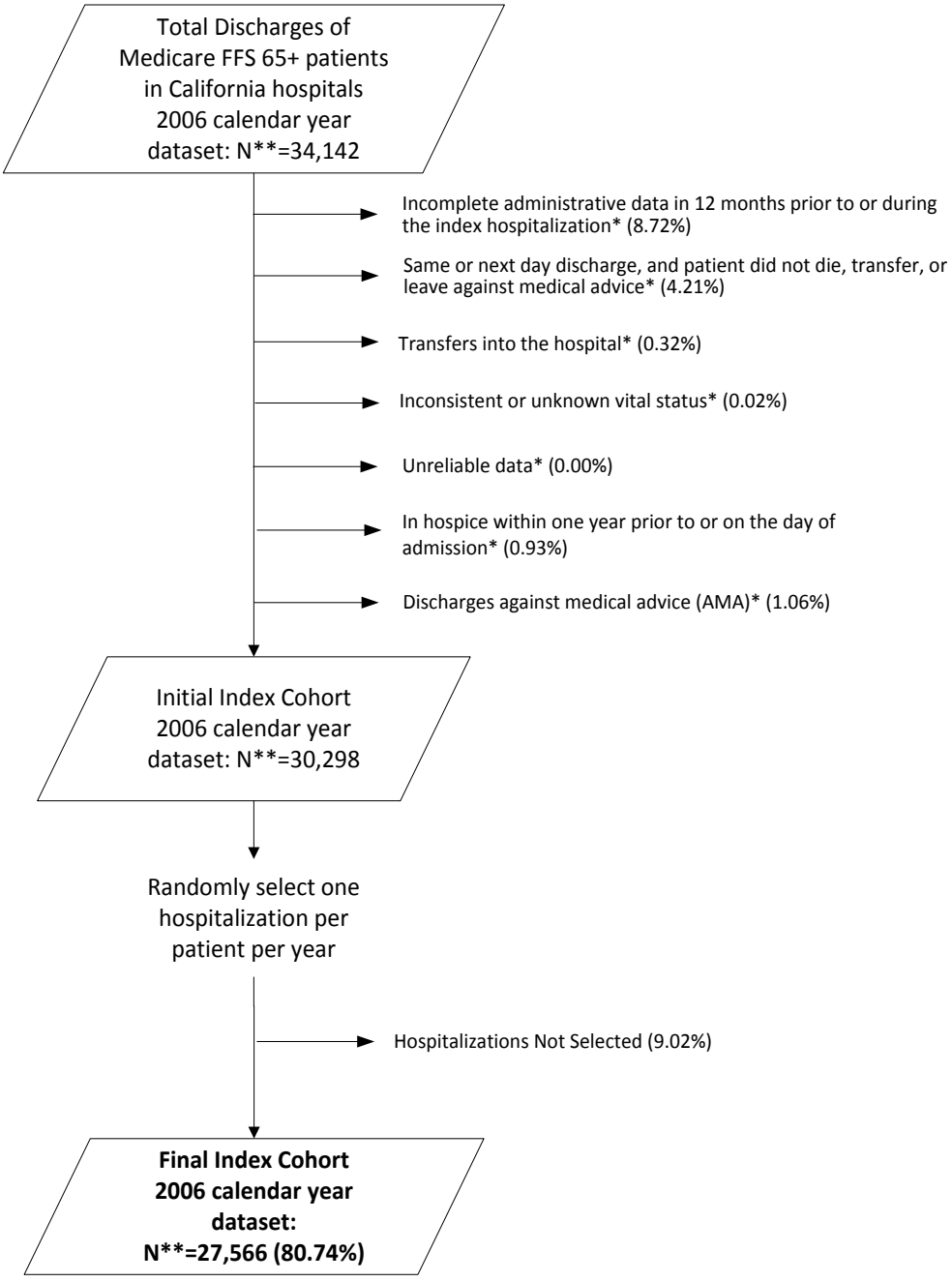
Figure 1 b. 2006 HF Mortality Cohort Using CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals



*Categories are not mutually exclusive

**N refers to the number of discharges.

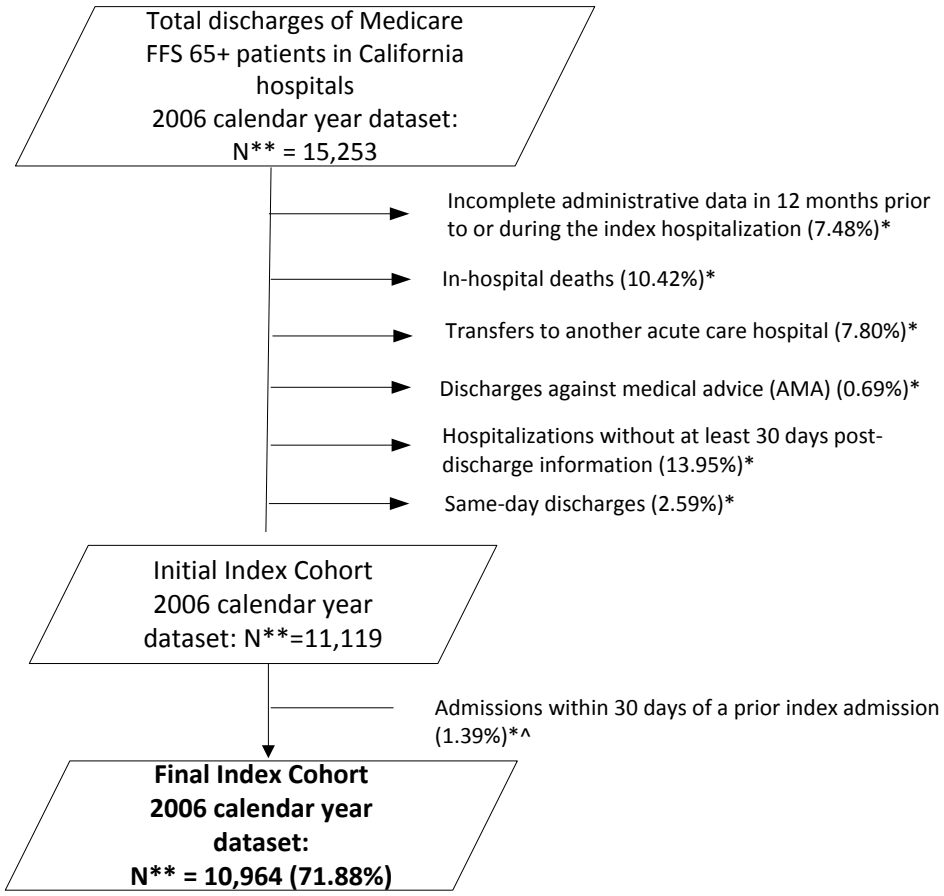
Figure 1 c. 2006 Pneumonia Mortality Cohort Using CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals



*Categories are not mutually exclusive

**N refers to the number of discharges.

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

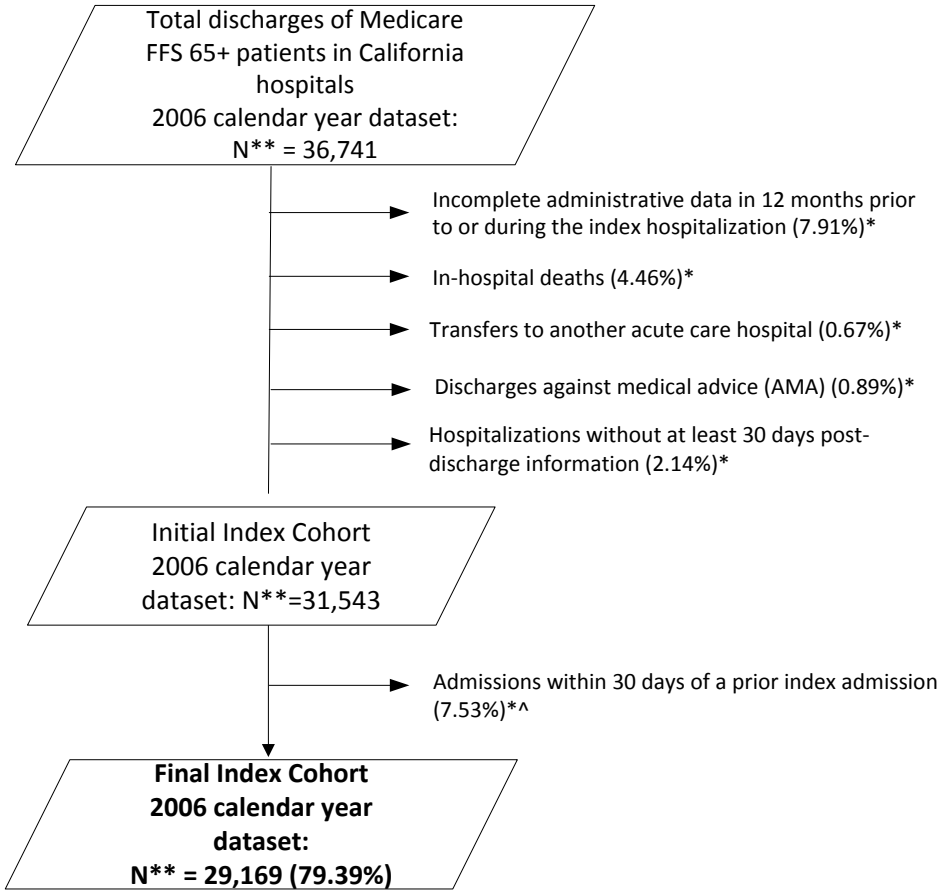


*Categories are not mutually exclusive.

**N refers to the number of discharges.

^If a patient has more than one admission within 30 days of discharge from the index hospitalization, only one is counted as a readmission. No admissions within 30 days of discharge from an index admission are considered as additional index admission.

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

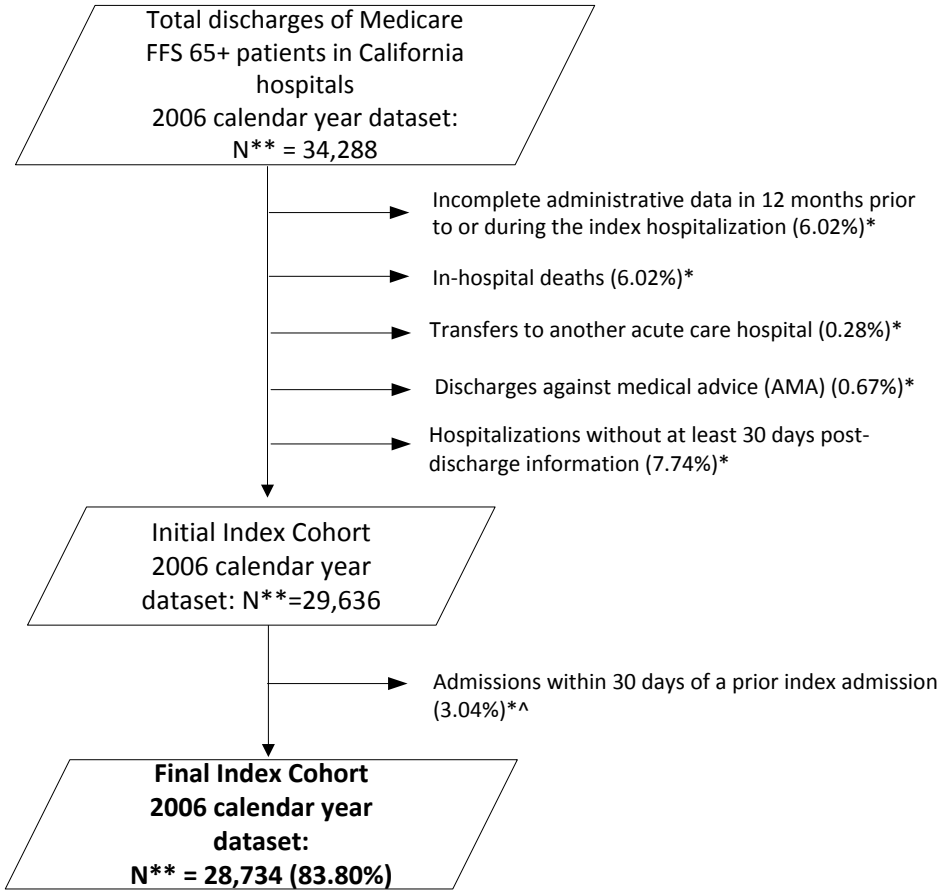


*Categories are not mutually exclusive.

**N refers to the number of discharges.

^If a patient has more than one admission within 30 days of discharge from the index hospitalization, only one is counted as a readmission. No admissions within 30 days of discharge from an index admission are considered as additional index admission.

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



*Categories are not mutually exclusive.

**N refers to the number of discharges.

^If a patient has more than one admission within 30 days of discharge from the index hospitalization, only one is counted as a readmission. No admissions within 30 days of discharge from an index admission are considered as additional index admission.

Table 1 a. 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)	80 (65-110)	
Male	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 (CC 82)	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.

** for both index admission and admissions in the past 12 months.

Table 1 b. Prevalence of Risk Factors for HF Mortality Model 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)	81 (65-109)	
Male	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 (CC 82)	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.

** for both index admission and admissions in the past 12 months.

Table 1 c. Prevalence of Risk Factors for Pneumonia Mortality Model Using Full Data vs. Using Only Admission Claims Data (N=27,566)

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)	81 (65-107)	
Male	12,380 (45)	
Cardiovascular		
History of PTCA	856 (3)	856 (3)
History of CABG	1,259 (5)	1,259 (5)
Congestive heart failure (CC 80)	10,750 (39)	5,744 (21)
Acute myocardial infarction (CC 81)	944 (3)	752 (3)
Unstable angina (CC 82)	2,055 (7)	453 (2)
Chronic atherosclerosis (CC 83, 84)	12,268 (45)	8,605 (31)
Cardio-respiratory failure and shock (CC 79)	4,668 (17)	2,349 (9)
Comorbidity		
Hypertension (CC 89, 91)	20,967 (76)	15,532 (56)
Stroke (CC 95, 96)	3,368 (12)	772 (3)
Cerebrovascular disease (CC 97 to 99, 103)	5,380 (20)	1,587 (6)
Renal failure (CC 131)	4,959 (18)	3,373 (12)
COPD (CC 108)	15,001 (54)	13,184 (48)
Pneumonia (CC 111 to 113)	12,158 (44)	5,829 (21)
Protein-calorie malnutrition (CC 21)	2,783 (10)	2,434 (9)
Dementia and senility (CC 49, 50)	8,246 (30)	6,122 (22)
Hemiplegia, paraplegia, paralysis, functional disability (CC 67-69, 100-102,177, 178)	2,488 (9)	1,236 (4)
Peripheral vascular disease (CC 104, 105)	6,709 (24)	2,037 (7)
Metastatic cancer, acute leukemia, and other severe cancers (CC 7, 8)	2,197 (8)	1,562 (6)
Trauma in last year (CC 154 to 156, 158 to 162)	10,327 (37)	3,542 (13)
Major psych disorders (CC 54 to 56)	3,301 (12)	1,224 (4)
Chronic liver disease (CC 25 to 27)	580 (2)	417 (2)
Severe hematological disorders (CC 44)	1,353 (5)	689 (2)
Iron deficiency/anemias/blood disease (CC 47)	13,508 (49)	9,052 (33)
Depression (CC 58)	3,769 (14)	2,541 (9)
Parkinson's/Huntington's diseases (CC 73)	1,307 (5)	906 (3)
Seizure disorders and convulsions (CC 74)	1,693 (6)	1,287 (5)
Fibrosis of lung and other chronic lung disorders (CC 109)	4,951 (18)	1,952 (7)
Asthma (CC 110)	3,734 (14)	1,397 (5)
Vertebral fractures (CC 157)	1,385 (5)	753 (3)

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

** for both index admission and admissions in the past 12 months.

Table 1 d. Prevalence of Risk Factors for AMI Readmission Model Using Full Data vs. Using Only Admission Claims Data (N=10,964)

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 (65-111)	
Male	5,476 (50)	
Cardiovascular		
Percutaneous Transluminal Coronary Angioplasty	868 (8)	869 (8)
Coronary Artery Bypass Graft Surgery	592 (5)	593 (5)
Congestive heart failure (CC 80)	3,485 (32)	2,148 (20)
Acute coronary syndrome (CC81, CC82)	2,423 (22)	1,188 (11)
Anterior Myocardial Infarction (ICD9 410.00-410.19)	1,406 (13)	1,406 (13)
Other Location of Myocardial Infarction (ICD9 410.20-410.69)	1,633 (15)	1,633 (15)
Angina pectoris, old MI (CC 83)	2,342 (21)	1,454 (13)
Coronary atherosclerosis (CC 84)	8,544 (78)	7,923 (72)
Valvular or rheumatic heart disease (CC 86)	3,372 (31)	2,267 (21)
Specified arrhythmias (CC 92 , 93)	3,558 (32)	1,792 (16)
Comorbidity		
History of infection (CC 1)	2,558 (23)	504 (5)
Metastatic cancer or acute leukemia (CC 7)	237 (2)	184 (2)
Cancer (CC 8-12)	1,970 (18)	634 (6)
Diabetes or DM complications (CC 15 to 20, 119, 120)	4,497 (41)	3,555 (32)
Protein-calorie malnutrition (CC 21)	388 (4)	349 (3)
Disorders of fluid, electrolyte, acid-base (CC 22, 23)	2,423 (22)	1,745 (16)
Iron deficiency or other anemias and blood disease (CC 47)	4,127 (38)	2,875 (26)
Dementia or other specified brain disorders (CC 49, 50)	1,806 (16)	1,202 (11)
Hemiplegia, paraplegia, paralysis, functional disability (CC 67 to 69, 100 to 102, 177, 178)	603 (5)	302 (3)
Stroke (CC 95 or 96)	954 (9)	224 (2)
Cerebrovascular disease (CC 97 to 99, 103)	1,917 (17)	454 (4)
Vascular or circulatory disease (CC 104 to 106)	3,313 (30)	1,130 (10)
Chronic Obstructive Pulmonary Disease (CC 108)	3,239 (30)	2,608 (24)
Asthma (CC 110)	749 (7)	303 (3)
Pneumonia (CC 111 to 113)	2,621 (24)	1,738 (16)
End stage renal disease or dialysis (CC 129, 130)	310 (3)	235 (2)
Renal failure (CC 131)	1,797 (16)	1,296 (12)
Other urinary tract disorders (CC 136)	2,368 (22)	1,154 (11)
Decubitus ulcer or chronic skin ulcer (CC 148, 149)	732 (7)	273 (2)

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

** for both index admission and admissions in the past 12 months.

Table 1 e. Prevalence of Risk Factors for HF Readmission Model 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)	81 (65-109)	
Male	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 81to 82)	5,881 (20)	3,319 (11)
Coronary atherosclerosis or angina (CC 83 to 84)	20,843 (71)	17,162 (59)
Valvular or rheumatic heart disease (CC 86)	14,414 (49)	9,435 (32)
Specified arrhythmias (CC 92 to 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 to 106)	12,826 (44)	4,820 (17)
Comorbidity		
Metastatic cancer or acute leukemia (CC 7)	659 (2)	445 (2)
Cancer (CC 8 to 12)	5,698 (20)	2,134 (7)
Diabetes or DM complications (CC 15 to 20, 119 to 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 to 23)	11,526 (40)	8,356 (29)
Liver or biliary disease (CC 25 to 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 to 50)	5,586 (19)	3,565 (12)
Drug/alcohol abuse/dependence/psychosis (CC 51 to 53)	2,597 (9)	2,251 (8)
Major psychiatric disorders (CC 54 to 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 to 69, 100 to 102, 177 to 178)	2,168 (7)	1,125 (4)
Stroke (CC 95 to 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 to 113)	12,572 (43)	7,963 (27)
End stage renal disease or dialysis (CC 129 to 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 to 149)	3,441 (12)	1,611 (6)

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

** for both index admission and admissions in the past 12 months.

Table 1 f. Prevalence of Risk Factors for Pneumonia Readmission Model Using Full Data vs. Using Only Admission Claims Data (N=28,734)

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)	81 (65-106)	
Male	13,016 (45)	
Comorbidity		
History of CABG	1,365 (5)	1,365 (5)
History of infection (CC 1, 3 to 6)	10,426 (36)	2,996 (10)
Septicemia/shock (CC 2)	2,438 (8)	1,565 (5)
Metastatic cancer or acute leukemia (CC 7)	1,227 (4)	887 (3)
Lung or other severe cancers (CC 8)	1,498 (5)	942 (3)
Other major cancers (CC 9 to 10)	4,534 (16)	1,899 (7)
Diabetes mellitus (DM) or DM complications (CC 15 to 20, 119 to 120)	10,735 (37)	8,178 (28)
Protein-calorie malnutrition (CC 21)	2,751 (10)	2,397 (8)
Disorders of fluid, electrolyte, acid-base (CC 22 to 23)	9,977 (35)	7,257 (25)
Other gastrointestinal disorders (CC 36)	14,989 (52)	8,621 (30)
Severe hematological disorders (CC 44)	1,340 (5)	673 (2)
Iron deficiency or other anemias and blood disease (CC 47)	14,021 (49)	9,493 (33)
Dementia or other specified brain disorders (CC 49 to 50)	8,449 (29)	6,315 (22)
Drug/alcohol abuse/dependence/psychosis (CC 51 to 53)	3,299 (11)	2,870 (10)
Major psychiatric disorders (CC 54 to 56)	3,465 (12)	1,321 (5)
Other psychiatric disorders (CC 60)	2,676 (9)	1,270 (4)
Hemiplegia, paraplegia, paralysis, functional disability (CC 67 to 69, 100 to 102, 177 to 178)	2,585 (9)	1,291 (4)
Cardio-respiratory failure or shock (CC 79)	5,026 (17)	2,572 (9)
Congestive heart failure (CC 80)	11,238 (39)	6,060 (21)
Acute coronary syndrome (CC 81 to 82)	2,612 (9)	1,180 (4)
Coronary atherosclerosis or angina (CC 83 to 84)	12,880 (45)	9,123 (32)
Valvular or rheumatic heart disease (CC 86)	7,205 (25)	3,252 (11)
Specified arrhythmias (CC 92 to 93)	11,640 (41)	5,585 (19)
Stroke (CC 95 to 96)	3,474 (12)	791 (3)
Vascular or circulatory disease (CC 104 to 106)	10,110 (35)	3,275 (11)
Chronic obstructive pulmonary disease (CC 108)	15,878 (55)	13,993 (49)
Fibrosis of lung or other chronic lung disorders (CC 109)	5,315 (18)	2,109 (7)
Asthma (CC 110)	4,045 (14)	1,513 (5)
Pneumonia (CC 111 to 113)	13,017 (45)	6,485 (23)
Pleural effusion/pneumothorax (CC 114)	3,558 (12)	862 (3)
Other lung disorders (CC 115)	12,889 (45)	3,613 (13)
End stage renal disease or dialysis (CC 129 to 130)	728 (3)	518 (2)
Renal failure (CC 131)	5,100 (18)	3,478 (12)
Urinary tract infection (CC 135)	7,828 (27)	4,005 (14)
Other urinary tract disorders (CC 136)	6,919 (24)	3,374 (12)
Decubitus ulcer or chronic skin ulcer (CC 148 to 149)	3,075 (11)	1,388 (5)

Risk Factor	Full data*	Admission claims data only**
	# (%)	# (%)
Vertebral fractures (CC 157)	1,451 (5)	782 (3)
Other injuries (CC 162)	9,877 (34)	3,059 (11)

* Including Part B, hospital outpatient, and hospital inpatient data.
** for both index admission and admissions in the past 12 months.

Table 2 a. Odds Ratios for Risk Factors in AMI Mortality Models With Full Data and With Only Admission Claims Data -- Logistic Regression Model (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**
	OR (95% CI)	OR (95% CI)
Demographics		
Age-65 (years above 65, continuous)	1.05 (1.05-1.06)	1.05 (1.05-1.06)
Male	1.28 (1.15-1.42)	1.26 (1.13-1.40)
Cardiovascular		
Percutaneous Transluminal Coronary Angioplasty	0.65 (0.50-0.83)	0.67 (0.52-0.86)
Coronary Artery Bypass Graft Surgery	0.79 (0.61-1.02)	0.86 (0.67-1.11)
Congestive Heart failure (CC 80)	1.44 (1.27-1.62)	1.91 (1.64-2.24)
Acute Myocardial Infarction (CC 81)	1.26 (1.07-1.48)	1.14 (0.92-1.41)
Unstable Angina (CC 82)	0.87 (0.74-1.02)	1.23 (0.94-1.61)
Anterior Myocardial Infarction (ICD9 410.00-410.19)	1.53 (1.32-1.76)	1.52 (1.31-1.76)
Other Location of Myocardial Infarction (ICD9 410.20-410.69)	1.36 (1.18-1.57)	1.38 (1.19-1.59)
Chronic atherosclerosis (CC 83 or 84)	0.51 (0.45-0.57)	0.46 (0.41-0.51)
Cardio-respiratory failure and shock (CC 79)	1.35 (1.13-1.61)	1.08 (0.84-1.39)
Valvular or Rheumatic Heart Disease (CC 86)	0.95 (0.85-1.06)	0.97 (0.86-1.10)
Comorbidity		
Hypertension (CC 89, 91)	0.73 (0.65-0.83)	0.67 (0.61-0.75)
Stroke (CC 95 or 96)	1.10 (0.92-1.31)	1.17 (0.83-1.66)
Cerebrovascular Disease (CC 97 to 99, 103)	1.18 (1.03-1.35)	1.44 (1.14-1.82)
Renal Failure (CC 131)	1.36 (1.18-1.55)	1.26 (1.06-1.50)
Chronic Obstructive Pulmonary Disease (CC 108)	1.03 (0.92-1.16)	0.99 (0.87-1.11)
Pneumonia (CC 111 to 113)	1.36 (1.21-1.53)	1.42 (1.25-1.62)
Diabetes and DM Complications (CC 15 to 20, 120)	1.19 (1.07-1.33)	1.05 (0.93-1.18)
Protein-Calorie Malnutrition (CC 21)	1.27 (1.01-1.59)	1.18 (0.92-1.51)
Dementia and Senility (CC 49 or 50)	1.35 (1.19-1.54)	1.48 (1.28-1.71)
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1.47 (1.21-1.79)	1.30 (0.96-1.76)
Vascular or Circulatory Disease (CC 104, 105)	0.99 (0.87-1.13)	0.96 (0.78-1.18)
Metastatic Cancer and Acute Leukemia (CC 7, 8)	1.91 (1.52-2.40)	2.83 (2.18-3.67)
Trauma (CC 154 to 156, 158 to 162)	0.94 (0.84-1.05)	0.89 (0.75-1.06)
Major Psych Disorders (CC 54 to 56)	1.13 (0.93-1.39)	1.35 (0.97-1.90)
Liver and Biliary Disease (CC 25 to 27)	1.34 (0.90-1.99)	1.75 (1.10-2.76)

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

** for both index admission and admissions in the past 12 months.

Table 2 b. Odds Ratios for Risk Factors in HF Mortality Models With Full Data and With Only Admission Claims Data -- Logistic Regression Model (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)	OR (95% CI)
Demographics		
Age-65 (years above 65, continuous)	1.05 (1.04-1.06)	1.05 (1.04-1.06)
Male	1.24 (1.14-1.35)	1.24 (1.14-1.35)
Cardiovascular		
Percutaneous Transluminal Coronary Angioplasty	0.61 (0.50-0.75)	0.61 (0.49-0.74)
Coronary Artery Bypass Graft Surgery	0.72 (0.62-0.85)	0.75 (0.64-0.88)
Congestive Heart failure (CC 80)	1.19 (1.07-1.32)	1.24 (1.12-1.37)
Acute Myocardial Infarction (CC 81)	1.53 (1.32-1.77)	1.61 (1.39-1.87)
Unstable Angina (CC 82)	0.95 (0.83-1.08)	0.88 (0.71-1.09)
Chronic atherosclerosis (CC 83 or 84)	0.86 (0.78-0.95)	0.89 (0.81-0.97)
Cardio-respiratory failure and shock (CC 79)	1.17 (1.06-1.30)	1.11 (0.97-1.27)
Valvular or Rheumatic Heart Disease (CC 86)	1.02 (0.94-1.11)	1.08 (0.99-1.18)
Comorbidity		
Hypertension (CC 89, 91)	0.65 (0.59-0.71)	0.68 (0.62-0.74)
Stroke (CC 95 or 96)	0.92 (0.81-1.05)	1.18 (0.93-1.50)
Renal Failure (CC 131)	1.30 (1.19-1.42)	1.18 (1.07-1.31)
Chronic Obstructive Pulmonary Disease (CC 108)	1.06 (0.98-1.16)	1.09 (1.00-1.19)
Pneumonia (CC 111 to 113)	1.37 (1.25-1.49)	1.36 (1.25-1.49)
Diabetes and DM Complications (CC 15 to 20, 120)	0.86 (0.79-0.94)	0.82 (0.75-0.89)
Protein-Calorie Malnutrition (CC 21)	1.74 (1.51-1.99)	1.70 (1.47-1.97)
Dementia and Senility (CC 49 or 50)	1.37 (1.24-1.50)	1.35 (1.21-1.51)
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1.08 (0.92-1.26)	1.10 (0.89-1.36)
Peripheral vascular disease (CC 104, 105)	0.95 (0.87-1.04)	1.07 (0.94-1.22)
Metastatic Cancer and Acute Leukemia (CC 7, 8)	1.96 (1.66-2.31)	2.66 (2.20-3.23)
Trauma (CC 154 to 156, 158 to 162)	1.06 (0.97-1.15)	1.07 (0.95-1.21)
Major Psych Disorders (CC 54 to 56)	0.97 (0.84-1.13)	0.92 (0.71-1.20)
Liver and Biliary Disease (CC 25 to 27)	1.24 (0.99-1.57)	1.24 (0.96-1.62)

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

** for both index admission and admissions in the past 12 months.

Table 2 c. Odds Ratios for Risk Factors in Pneumonia Mortality Models With Full Data and With Only Admission Claims Data -- Logistic Regression Model (N=27,566)

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)	OR (95% CI)
Demographics		
Age-65 (years above 65, continuous)	1.05 (1.04-1.05)	1.05 (1.05-1.06)
Male	1.23 (1.14-1.33)	1.22 (1.13-1.32)
Cardiovascular		
History of PTCA	0.63 (0.48-0.83)	0.68 (0.51-0.89)
History of CABG	0.63 (0.51-0.79)	0.66 (0.53-0.82)
Congestive heart failure (CC 80)	1.29 (1.19-.140)	1.43 (1.29-1.58)
Acute myocardial infarction (CC 81)	1.49 (1.23-1.81)	1.47 (1.20-1.81)
Unstable angina (CC 82)	0.87 (0.75-1.02)	0.65 (0.45-0.92)
Chronic atherosclerosis (CC 83, 84)	0.94 (0.87-1.02)	0.87 (0.79-0.95)
Cardio-respiratory failure and shock (CC 79)	1.27 (1.15-1.40)	1.39 (1.23-1.59)
Comorbidity		
Hypertension (CC 89, 91)	0.77 (0.71-0.84)	0.69 (0.64-0.75)
Stroke (CC 95, 96)	1.09 (0.97-1.23)	1.26 (1.03-1.55)
Cerebrovascular disease (CC 97 to 99, 103)	0.92 (0.83-1.01)	0.97 (0.83-1.14)
Renal failure (CC 131)	1.22 (1.10-1.34)	1.23 (1.10-1.38)
COPD (CC 108)	1.09 (1.01-1.18)	1.00 (0.93-1.08)
Pneumonia (CC 111 to 113)	1.15 (1.06-1.24)	1.10 (0.99-1.21)
Protein-calorie malnutrition (CC 21)	2.04 (1.85-2.26)	2.10 (1.90-2.34)
Dementia and senility (CC 49, 50)	1.52 (1.40-1.65)	1.49 (1.37-1.63)
Hemiplegia, paraplegia, paralysis, functional disability (CC 67to 69, 100 to 102, 177, 178)	1.05 (0.93-1.20)	1.15 (0.96-1.37)
Peripheral vascular disease (CC 104, 105)	1.04 (0.95-1.14)	1.17 (1.02-1.34)
Metastatic cancer, acute leukemia, and other severe cancers (CC 7, 8)	3.09 (2.77-3.46)	4.17 (3.69-4.71)
Trauma in last year (CC 154 to 156, 158 to 162)	1.05 (0.97-1.14)	1.08 (0.98-121)
Major psych disorders (CC 54 to 56)	1.01 (0.90-1.13)	0.92 (0.76-1.11)
Chronic liver disease (CC 25 to 27)	1.38 (1.09-1.74)	1.47 (1.12-1.94)
Severe hematological disorders (CC 44)	1.32 (1.13-1.53)	1.60 (1.31-1.95)
Iron deficiency/anemias/blood disease (CC 47)	1.03 (0.95-1.11)	0.88 (0.82-0.96)
Depression (CC 58)	0.95 (0.85-1.06)	0.83 (0.72-0.95)
Parkinson's/Huntington's diseases (CC 73)	1.27 (1.08-1.48)	1.18 (0.97-1.43)
Seizure disorders and convulsions (CC 74)	0.96 (0.82-1.11)	1.00 (0.84-1.18)
Fibrosis of lung and other chronic lung disorders (CC 109)	0.93 (0.85-1.03)	1.11 (0.97-1.28)
Asthma (CC 110)	0.65 (0.57-0.74)	0.54 (0.43-0.67)
Vertebral fractures (CC 157)	1.10 (0.94-1.28)	1.30 (1.07-1.59)

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

** for both index admission and admissions in the past 12 months.

Table 2 d. Odds Ratios for Risk Factors in AMI Readmission Models With Full Data and With Only Admission Claims Data -- Logistic Regression Model (N=10,964)

Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

Description	Full data*	Admission claims data only**
	OR (95% CI)	OR (95% CI)
Demographics		
Age-65 (years above 65, continuous)	1.01 (1.00-1.01)	1.01 (1.00-1.02)
Male	0.78 (0.71-0.87)	0.78 (0.71-0.87)
Cardiovascular		
Percutaneous Transluminal Coronary Angioplasty	0.82 (0.67-1.00)	0.85 (0.69-1.03)
Coronary Artery Bypass Graft Surgery	1.22 (0.99-1.50)	1.30 (1.06-1.61)
Congestive heart failure (CC 80)	1.10 (0.97-1.24)	1.17 (1.01-1.35)
Acute coronary syndrome (CC 81, 82)		
Anterior Myocardial Infarction (ICD9 410.00-410.19)	1.12 (0.97-1.30)	1.10 (0.95-1.28)
Other Location of Myocardial Infarction (ICD9 410.20-410.69)	0.93 (0.79-1.08)	0.90 (0.78-1.05)
Angina pectoris, old MI (CC 83)	1.06 (0.93-1.21)	1.07 (0.92-1.24)
Coronary atherosclerosis (CC 84)	0.88 (0.78-0.99)	0.83 (0.74-0.93)
Valvular or rheumatic heart disease (CC 86)	1.15 (1.03-1.28)	1.15 (1.02-1.29)
Specified arrhythmias (CC 92, 93)	1.10 (0.99-1.24)	1.10 (0.96-1.26)
Comorbidity		
History of infection (CC 1)	1.04 (0.93-1.17)	1.11 (0.89-1.38)
Metastatic cancer or acute leukemia (CC 7)	1.43 (1.05-1.97)	1.29 (0.89-1.88)
Cancer (CC 8 to 12)	0.97 (0.84-1.10)	1.15 (0.92-1.42)
Diabetes or DM complications (CC 15 to 20, 119, 120)	1.16 (1.04-1.28)	1.19 (1.07-1.33)
Protein-calorie malnutrition (CC 21)	1.27 (1.00-1.61)	1.25 (0.97-1.61)
Disorders of fluid, electrolyte, acid-base (CC 22, 23)	1.02 (0.89-1.16)	1.12 (0.97-1.29)
Iron deficiency or other anemias and blood disease (CC 47)	1.23 (1.10-1.37)	1.10 (0.98-1.23)
Dementia or other specified brain disorders (CC 49, 50)	1.01 (0.88-1.15)	0.96 (0.82-1.12)
Hemiplegia, paraplegia, paralysis, functional disability (CC 67 to 69, 100 to 102, 177, 178)	1.04 (0.84-1.29)	1.17 (0.87-1.57)
Stroke (CC 95 or 96)	1.01 (0.84-1.21)	0.80 (0.56-1.15)
Cerebrovascular disease (CC 97 to 99, 103)	1.08 (0.95-1.24)	1.27 (1.01-1.60)
Vascular or circulatory disease (CC 104, 105, 106)	1.10 (0.98-1.23)	1.13 (0.97-1.33)
Chronic Obstructive Pulmonary Disease (CC 108)	1.11 (0.99-1.24)	1.15 (1.02-1.29)
Asthma (CC 110)	1.14 (0.95-1.37)	1.18 (0.89-1.56)
Pneumonia (CC 111 to 113)	1.07 (0.94-1.20)	0.99 (0.87-1.14)
End stage renal disease or dialysis (CC 129, 130)	1.35 (1.03-1.77)	1.42 (1.04-1.94)
Renal failure (CC 131)	1.22 (1.05-1.42)	1.28 (1.08-1.52)
Other urinary tract disorders (CC 136)	1.13 (1.00-1.28)	1.12 (0.96-1.31)
Decubitus ulcer or chronic skin ulcer (CC 148, 149)	1.07 (0.89-1.29)	0.97 (0.72-1.30)

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

** for both index admission and admissions in the past 12 months.

Table 2 e. Odds Ratios for Risk Factors in HF Readmission Models With Full Data and With Only Admission Claims Data -- Logistic Regression Model (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)	OR (95% CI)
Demographics		
Age-65 (years above 65, continuous)	1.00 (1.00-1.00)	1.00 (1.00-1.00)
Male	1.01 (0.95-1.07)	1.03 (0.97-1.09)
Cardiovascular		
History of CABG	0.94 (0.86-1.03)	0.95 (0.87-1.04)
Cardio-respiratory failure or shock (CC 79)	1.15 (1.07-1.23)	1.11 (1.01-1.21)
Congestive heart failure (CC 80)	1.14 (1.06-1.23)	1.18 (1.09-1.27)
Acute coronary syndrome (CC 81 to 82)	1.07 (1.00-1.15)	1.02 (0.93-1.11)
Coronary atherosclerosis or angina (CC 83 to 84)	1.16 (1.08-1.24)	1.13 (1.06-1.20)
Valvular or rheumatic heart disease (CC 86)	1.07 (1.01-1.13)	1.10 (1.03-1.16)
Specified arrhythmias (CC 92 to 93)	1.01 (0.95-1.08)	1.06 (0.99-1.13)
Other or unspecified heart disease (CC 94)	1.03 (0.97-1.10)	0.92 (0.80-1.06)
Vascular or circulatory disease (CC 104 to 106)	1.04 (0.98-1.10)	1.09 (1.01-1.18)
Comorbidity		
Metastatic cancer or acute leukemia (CC 7)	1.13 (0.94-1.36)	1.37 (1.10-1.70)
Cancer (CC 8 to 12)	1.05 (0.98-1.13)	1.03 (0.92-1.15)
Diabetes or DM complications (CC 15 to 20, 119 to 120)	1.10 (1.04-1.17)	1.12 (1.06-1.19)
Protein-calorie malnutrition (CC 21)	0.98 (0.87-1.10)	1.01 (0.89-1.15)
Disorders of fluid, electrolyte, acid-base (CC 22 to 23)	1.16 (1.09-1.24)	1.16 (1.08-1.24)
Liver or biliary disease (CC 25 to 30)	1.05 (0.95-1.15)	1.06 (0.94-1.20)
Peptic ulcer, hemorrhage, other specified gastrointestinal disorders (CC 34)	1.16 (1.07-1.25)	1.12 (1.01-1.23)
Other gastrointestinal disorders (CC 36)	1.04 (0.98-1.10)	1.08 (1.01-1.15)
Severe hematological disorders (CC 44)	1.13 (1.00-1.28)	1.21 (1.02-1.44)
Iron deficiency or other anemias and blood disease (CC 47)	1.04 (0.98-1.11)	1.08 (1.01-1.14)
Dementia or other specified brain disorders (CC 49 to 50)	1.03 (0.96-1.11)	0.97 (0.89-1.06)
Drug/alcohol abuse/dependence/psychosis (CC 51 to 53)	1.07 (0.97-1.18)	1.02 (0.92-1.13)
Major psychiatric disorders (CC 54 to 56)	1.07 (0.97-1.19)	1.15 (0.97-1.35)
Depression (CC 58)	1.05 (0.95-1.14)	1.09 (0.98-1.20)
Other psychiatric disorders (CC 60)	1.04 (0.94-1.15)	1.09 (0.95-1.25)
Hemiplegia, paraplegia, paralysis, functional disability (CC 67 to 69, 100 to 102, 177 to 178)	1.06 (0.95-1.17)	1.17 (1.02-1.34)
Stroke (CC 95 to 96)	1.02 (0.94-1.12)	1.01 (0.86-1.19)
Chronic obstructive pulmonary disease (CC 108)	1.11 (1.05-1.18)	1.10 (1.04-1.17)
Fibrosis of lung or other chronic lung disorders (CC 109)	1.09 (1.01-1.18)	1.05 (0.92-1.20)
Asthma (CC 110)	1.07 (0.99-1.17)	1.03 (0.90-1.18)
Pneumonia (CC 111 to 113)	1.10 (1.04-1.17)	1.10 (1.03-1.17)
End stage renal disease or dialysis (CC 129 to 130)	1.24 (1.10-1.40)	1.43 (1.26-1.63)
Renal failure (CC 131)	1.20 (1.12-1.29)	1.20 (1.12-1.29)
Nephritis (CC 132)	0.99 (0.87-1.13)	0.91 (0.77-1.07)

Risk Factor	Full data*	Admission claims data only**
	OR (95% CI)	OR (95% CI)
Other urinary tract disorders (CC 136)	1.09 (1.02-1.16)	1.17 (1.09-1.25)
Decubitus ulcer or chronic skin ulcer (CC 148 to 149)	1.18 (1.08-1.28)	1.26 (1.13-1.41)

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

** for both index admission and admissions in the past 12 months.

Table 2 f. Odds Ratios for Risk Factors in Pneumonia Readmission Models With Full Data and With Only Admission Claims Data -- Logistic Regression Model (N=28,734)

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)	OR (95% CI)
Demographics		
Age-65 (years above 65, continuous)	1.00 (1.00-1.00)	1.00 (1.00-1.00)
Male	1.08 (1.01-1.15)	1.07 (1.01-1.14)
Comorbidity		
History of CABG	0.73 (0.62-0.86)	0.75 (0.64-0.89)
History of infection (CC 1, 3 to 6)	1.06 (0.99-1.13)	1.25 (1.13-1.38)
Septicemia/shock (CC 2)	1.07 (0.96-1.19)	1.05 (0.92-1.20)
Metastatic cancer or acute leukemia (CC 7)	1.51 (1.29-1.77)	1.51 (1.27-1.80)
Lung or other severe cancers (CC 8)	1.30 (1.14-1.50)	1.35 (1.15-1.60)
Other major cancers (CC 9 to 10)	0.97 (0.89-1.06)	1.05 (0.93-1.19)
Diabetes mellitus (DM) or DM complications (CC 15 to 20, 119 to 120)	1.05 (0.99-1.13)	1.13 (1.05-1.21)
Protein-calorie malnutrition (CC 21)	1.23 (1.12-1.36)	1.24 (1.12-1.38)
Disorders of fluid, electrolyte, acid-base (CC 22 to 23)	1.19 (1.11-1.28)	1.16 (1.07-1.25)
Other gastrointestinal disorders (CC 36)	1.04 (0.98-1.11)	1.03 (0.96-1.10)
Severe hematological disorders (CC 44)	1.20 (1.05-1.38)	1.31 (1.09-1.57)
Iron deficiency or other anemias and blood disease (CC 47)	1.08 (1.01-1.15)	1.12 (1.05-1.20)
Dementia or other specified brain disorders (CC 49 to 50)	1.05 (0.97-1.13)	1.08 (0.99-1.16)
Drug/alcohol abuse/dependence/psychosis (CC 51 to 53)	1.00 (0.91-1.10)	0.94 (0.85-1.04)
Major psychiatric disorders (CC 54 to 56)	1.05 (0.95-1.15)	1.17 (1.02-1.34)
Other psychiatric disorders (CC 60)	1.13 (1.02-1.25)	1.14 (0.99-1.31)
Hemiplegia, paraplegia, paralysis, functional disability (CC 67 to 69, 100 to 102, 177 to 178)	0.95 (0.85-1.06)	0.98 (0.85-1.14)
Cardio-respiratory failure or shock (CC 79)	1.24 (1.14-1.34)	1.16 (1.04-1.29)
Congestive heart failure (CC 80)	1.18 (1.10-1.27)	1.22 (1.12-1.33)
Acute coronary syndrome (CC 81 to 82)	1.17 (1.06-1.30)	1.15 (0.99-1.32)
Coronary atherosclerosis or angina (CC 83 to 84)	1.04 (0.97-1.12)	1.04 (0.97-1.12)
Valvular or rheumatic heart disease (CC 86)	1.12 (1.04-1.20)	1.13 (1.03-1.24)
Specified arrhythmias (CC 92 to 93)	1.04 (0.97-1.11)	1.08 (1.00-1.18)
Stroke (CC 95 to 96)	1.09 (0.99-1.20)	1.13 (0.94-1.36)
Vascular or circulatory disease (CC 104 to 106)	1.01 (0.95-1.08)	1.00 (0.91-1.10)
Chronic obstructive pulmonary disease (CC 108)	1.23 (1.15-1.32)	1.24 (1.16-1.33)
Fibrosis of lung or other chronic lung disorders (CC 109)	1.05 (0.97-1.14)	1.28 (1.15-1.43)
Asthma (CC 110)	1.04 (0.95-1.14)	0.96 (0.84-1.11)
Pneumonia (CC 111 to 113)	1.09 (1.01-1.17)	1.07 (0.99-1.17)
Pleural effusion/pneumothorax (CC 114)	1.03 (0.94-1.13)	0.97 (0.83-1.15)
Other lung disorders (CC 115)	0.98 (0.92-1.05)	1.05 (0.96-1.15)
End stage renal disease or dialysis (CC 129 to 130)	1.37 (1.14-1.64)	1.33 (1.08-1.64)
Renal failure (CC 131)	1.11 (1.01-1.21)	1.25 (1.13-1.38)
Urinary tract infection (CC 135)	1.08 (1.00-1.16)	1.04 (0.95-1.15)

Risk Factor	Full data*	Admission claims data only**
	OR (95% CI)	OR (95% CI)
Other urinary tract disorders (CC 136)	1.07 (0.99-1.15)	1.10 (1.00-1.21)
Decubitus ulcer or chronic skin ulcer (CC 148 to 149)	1.09 (0.99-1.20)	1.11 (0.97-1.27)
Vertebral fractures (CC 157)	1.15 (1.01-1.31)	1.24 (1.04-1.47)
Other injuries (CC 162)	1.03 (0.97-1.10)	1.00 (0.91-1.11)

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

** for both index admission and admissions in the past 12 months.

Table 3 a. 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 Admission Claims Only Data**	Model with Full Data*									
	0 to <5%		5% to <10%		10% to <20%		>=20%		Total	
	#	Column %	#	Column %	#	Column %	#	Column %	#	
Risk Category										
0 to <5%	375	77.80	221	7.69	12	0.27	0	0.00	608	
5% to <10%	98	20.33	2,151	74.84	820	18.71	25	0.68	3,094	Same category: 72.65
10% to <20%	9	1.87	471	16.39	2,824	64.45	709	19.27	4,013	Similar category: 99.33
>=20%	0	0.00	31	1.08	726	16.57	2,946	80.05	3,703	NRI=-0.0116; p<0.0001
Total	482	-	2,874	-	4,382	-	3,680	-	11,418	IDI=0.0010; p<0.0001

* Including Part B, hospital outpatient, and hospital inpatient data.
** for both index admission and admissions in the past 12 months.

Table 3 b. 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 Admission Claims Only Data**	Model with Full Data*									
	0 to <5%		5% to <10%		10% to <20%		>=20%		Total	
	#	Column %	#	Column %	#	Column %	#	Column %	#	
Risk Category										
0 to <5%	2,028	72.95	741	8.15	24	0.25	1	0.04	2,794	
5% to <10%	752	27.05	6,764	74.40	1,572	16.65	29	1.07	9,117	Same category: 73.54
10% to <20%	0	0.00	1,586	17.44	7,017	74.32	825	30.31	9,428	Similar category: 99.76
>=20%	0	0.00	1	0.01	828	8.77	1,867	68.59	2,696	NRI=-0.0116; p=0.2566
Total	2,780	-	9,092	-	9,441	-	2,722	-	24,035	IDI=0.0010; p=0.2554

* Including Part B, hospital outpatient, and hospital inpatient data.
** for both index admission and admissions in the past 12 months.

Table 3 c. Reclassification Table of Risk Categories for Pneumonia 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 Admission Claims Only Data**	Model with Full Data*									
	0 to <5%		5% to <10%		10% to <20%		>=20%		Total	
	#	Column %	#	Column %	#	Column %	#	Column %	#	
Risk Category										
0 to <5%	2,463	70.63	1,003	10.39	91	0.91	11	0.25	3,568	
5% to <10%	1,014	29.08	6,929	71.78	1,834	18.31	156	3.54	9,933	Same category: 70.83
10% to <20%	10	0.29	1,705	17.66	6,918	69.08	1,030	23.35	9,663	Similar category: 98.98
>=20%	0	0.00	16	0.17	1,172	11.70	3,214	72.86	4,402	NRI=-0.0196; p=0.0384
Total	3,487	-	9,653	-	10,015	-	4,411	-	27,566	IDI=0.0068; p<0.0001

* Including Part B, hospital outpatient, and hospital inpatient data.
** for both index admission and admissions in the past 12 months.

Table 3 d. Reclassification Table of Risk Categories for AMI 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 Admission Claims Only Data**	Model with Full Data*									
	0 to <15%		15% to <20%		20% to <25%		>=25%		Total	
	#	Column %	#	Column %	#	Column %	#	Column %	#	
Risk Category										
0 to <15%	2,737	74.44	556	15.46	80	3.99	17	1.01	3,390	
15% to <20%	902	24.53	2,339	65.04	721	35.98	137	8.12	4,099	Same category: 64.90
10% to <25%	37	1.01	642	17.85	881	43.96	363	21.52	1,923	Similar category: 96.90
>=25%	1	0.03	59	1.64	322	16.07	1,170	69.35	1,552	NRI=0.0251; p=0.1139
Total	3,677	-	3,596	-	2,004	-	1,687	-	10,964	IDI=-0.0028; p=0.0023

* Including Part B, hospital outpatient, and hospital inpatient data.
** for both index admission and admissions in the past 12 months.

Table 3 e. 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 Admission Claims Only Data**	Model with Full Data*											
	0 to <15%		15% to <20%		20% to <25%		25% to <30%		>=30%		Total	
	#	Column %	#	Column %	#	Column %	#	Column %	#	Column %	#	
Risk Category												
0 to <15%	472	23.71	420	4.99	75	1.00	10	0.19	2	0.03	979	
15% to <20%	1,515	76.09	6,144	73.06	2,312	30.84	464	8.67	95	1.61	10,530	
20% to <25%	4	0.20	1,788	21.26	3,306	44.10	1,207	22.54	254	4.29	6,559	Same category: 57.32
25% to <30%	0	0.00	57	0.68	1,699	22.66	2,370	44.27	1,139	19.25	5,265	Similar category: 96.34
>=30%	0	0.00	0	0.00	105	1.40	1,303	24.34	4,428	74.82	5,807	NRI=0.0147; p=0.0941
Total	1,991	-	8,409	-	7,497	-	5,354	-	5,918	-	29,140	IDI=0.0009; p=0.1139

* Including Part B, hospital outpatient, and hospital inpatient data.
** for both index admission and admissions in the past 12 months.

Table 3 f. Reclassification Table of Risk Categories for Pneumonia 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 Admission Claims Only Data**	Model with Full Data*									
	0 to <15%		15% to <20%		20% to <25%		>=25%		Total	
	#	Column %	#	Column %	#	Column %	#	Column %	#	
Risk Category										
0 to <15%	10,522	82.64	2,364	31.29	345	8.66	62	1.39	13,293	
15% to <20%	2,166	17.01	3,737	49.46	1,120	28.10	309	6.93	7,332	Same category: 66.52
20% to <25%	45	0.35	1,310	17.34	1,605	40.27	844	18.93	3,804	Similar category: 96.88
>=25%	0	0.00	145	1.92	916	22.98	3,244	72.75	4,305	NRI=-0.0107; p=0.2799
Total	12,733	-	7,556	-	3,986	-	4,459	-	28,734	IDI=-0.0007; p=0.3007

* Including Part B, hospital outpatient, and hospital inpatient data.
** for both index admission and admissions in the past 12 months.

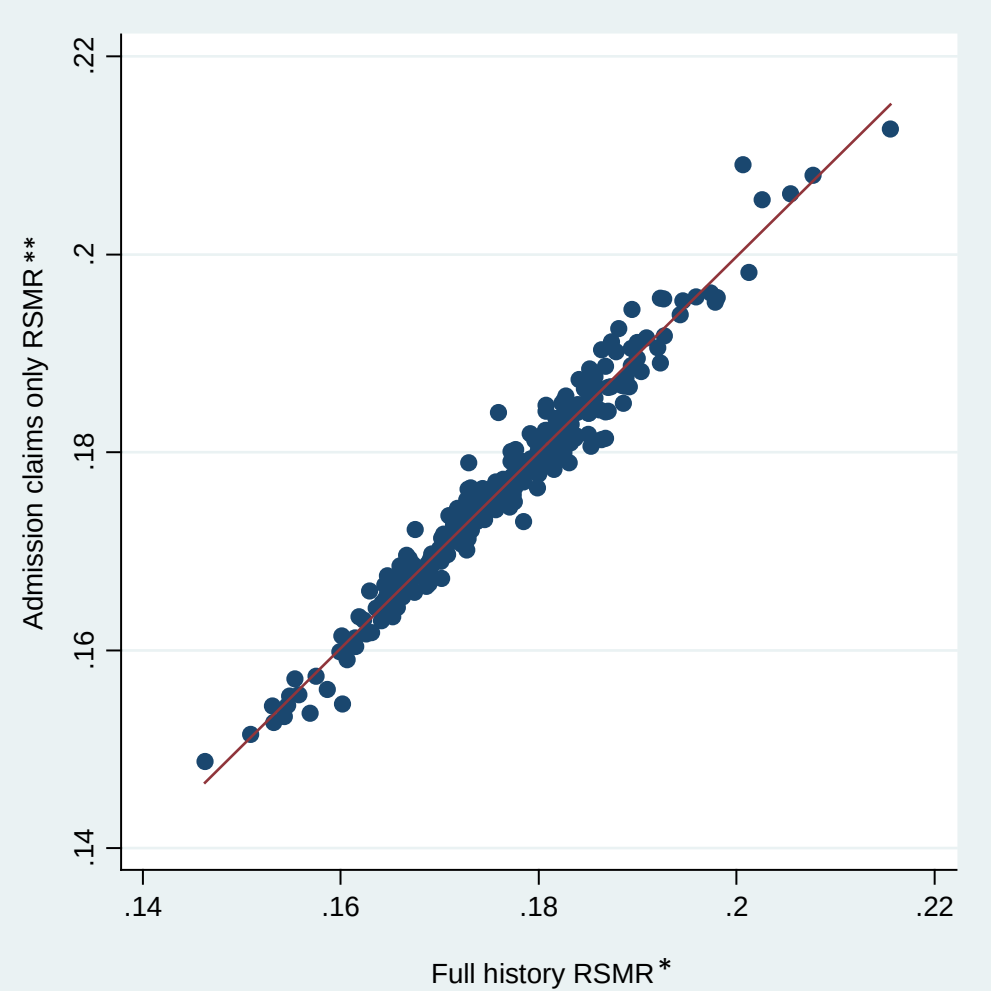
Table 4 a. Performance of AMI Mortality Logistic Regression Model With Full Data and With Only Admission Claims Data

Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

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

Figure 2 a. Scatterplot of AMI 30-day Risk-Standardized Mortality Rates (RSMR) 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



Intra-class Correlation Coefficients (ICC): 0.984

Note: 1) RSMRs are in proportions.
2) Diagonal line represents the fitted line.

* Including Part B, hospital outpatient, and hospital inpatient data.
** for both index admission and admissions in the past 12 months.

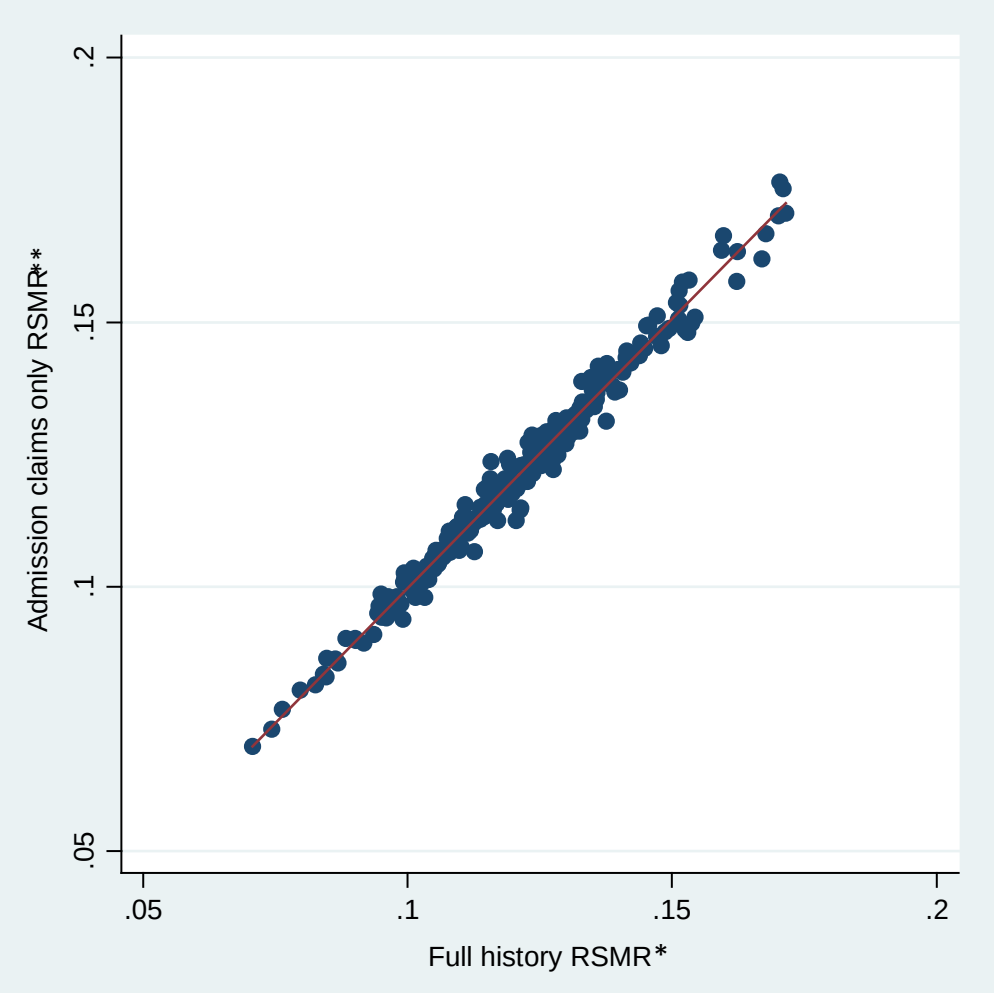
Table 4 b. Performance of HF Mortality Logistic Regression Model With Full Data and With Only Admission Claims Data

Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

	Model with full data*	Model with admission claims data only**
C-statistic	0.681	0.684

Figure 2 b. Scatterplot of HF 30-day Risk-Standardized Mortality Rates (RSMR) 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



Intra-class Correlation Coefficients (ICC): 0.993

Note: 1) RSMRs are in proportions.
2) Diagonal line represents the fitted line.

* Including Part B, hospital outpatient, and hospital inpatient data.
** for both index admission and admissions in the past 12 months.

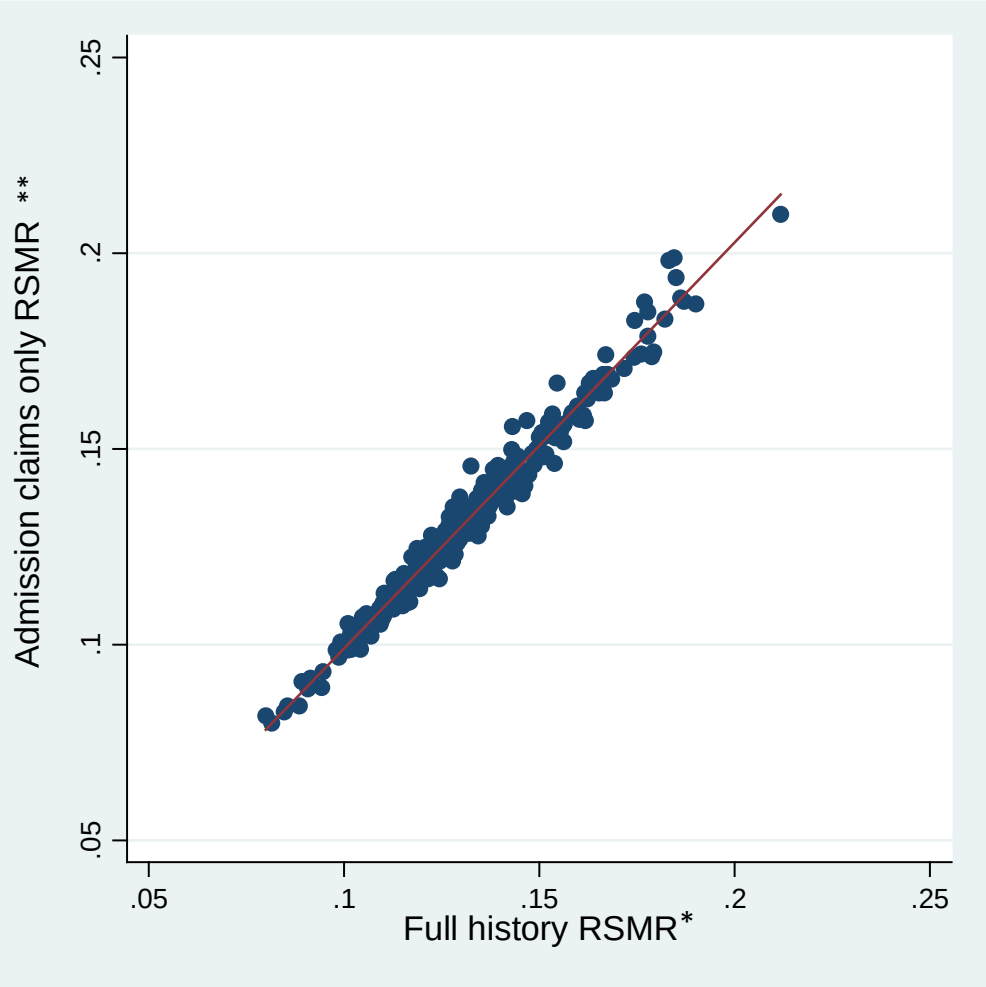
Table 4 c. Performance of Pneumonia Mortality Logistic Regression Model With Full Data and With Only Admission Claims Data

Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

	Model with full data*	Model with admission claims data only**
C-statistic	0.713	0.719

Figure 2 c. Scatterplot of Pneumonia 30-day Risk-Standardized Mortality Rates (RSMR) from Model Using Full Data and from Model Using Only Admission Claims Data (N=341 Hospitals)

Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals



Intra-class Correlation Coefficients (ICC): 0.989

Note: 1) RSMRs are in proportions.
2) Diagonal line represents the fitted line.

* Including Part B, hospital outpatient, and hospital inpatient data.
** for both index admission and admissions in the past 12 months.

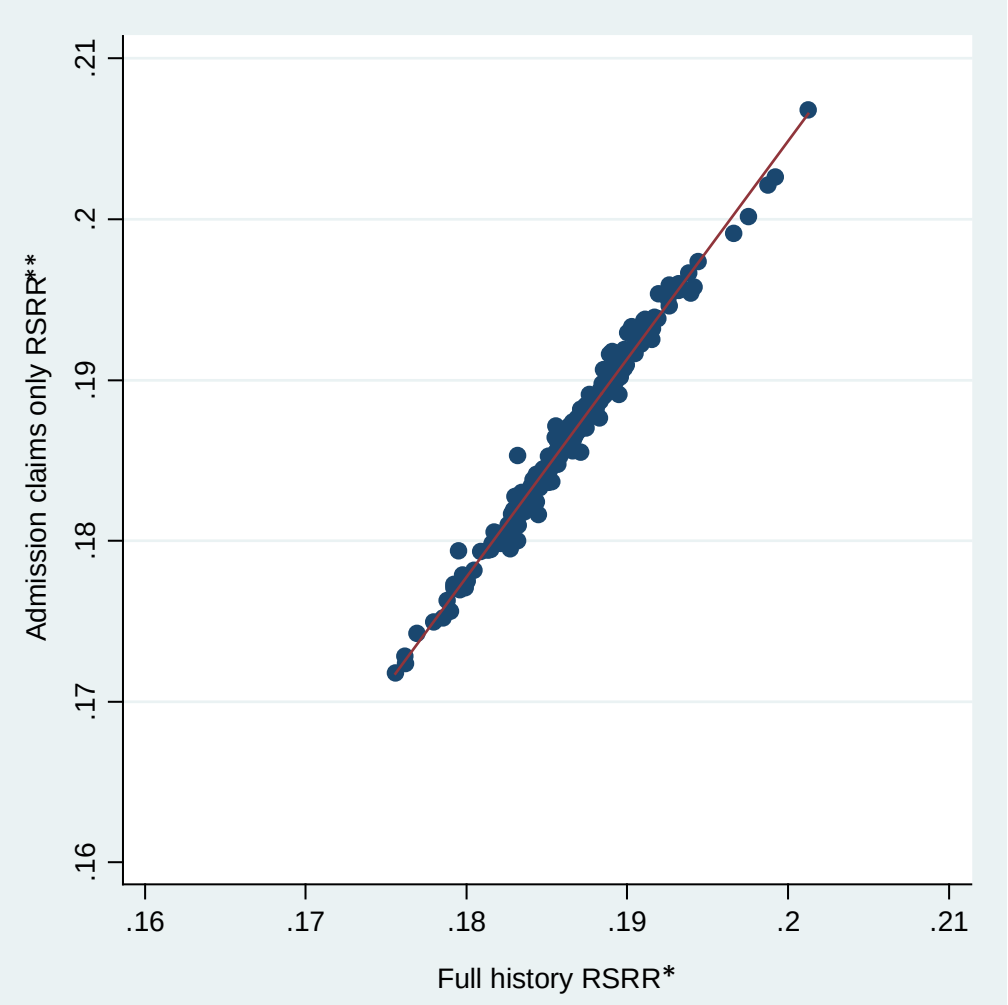
Table 4 d. Performance of AMI Readmission Logistic Regression Model With Full Data and With Only Admission Claims Data

Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

	Model with full data*	Model with admission claims data only**
C-statistic	0.619	0.614

Figure 2 d. Scatterplot of AMI 30-day Risk-Standardized Readmission Rates (RSRR) from Model Using Full Data (Part A and Part B) and from Model Using Only Admission Claims Data (N=302 Hospitals)

Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals



Intra-class Correlation Coefficients (ICC): 0.950

Note: 1) RSRRs are in proportions.
2) Diagonal line represents the fitted line.

* Including Part B, hospital outpatient, and hospital inpatient data.
** for both index admission and admissions in the past 12 months.

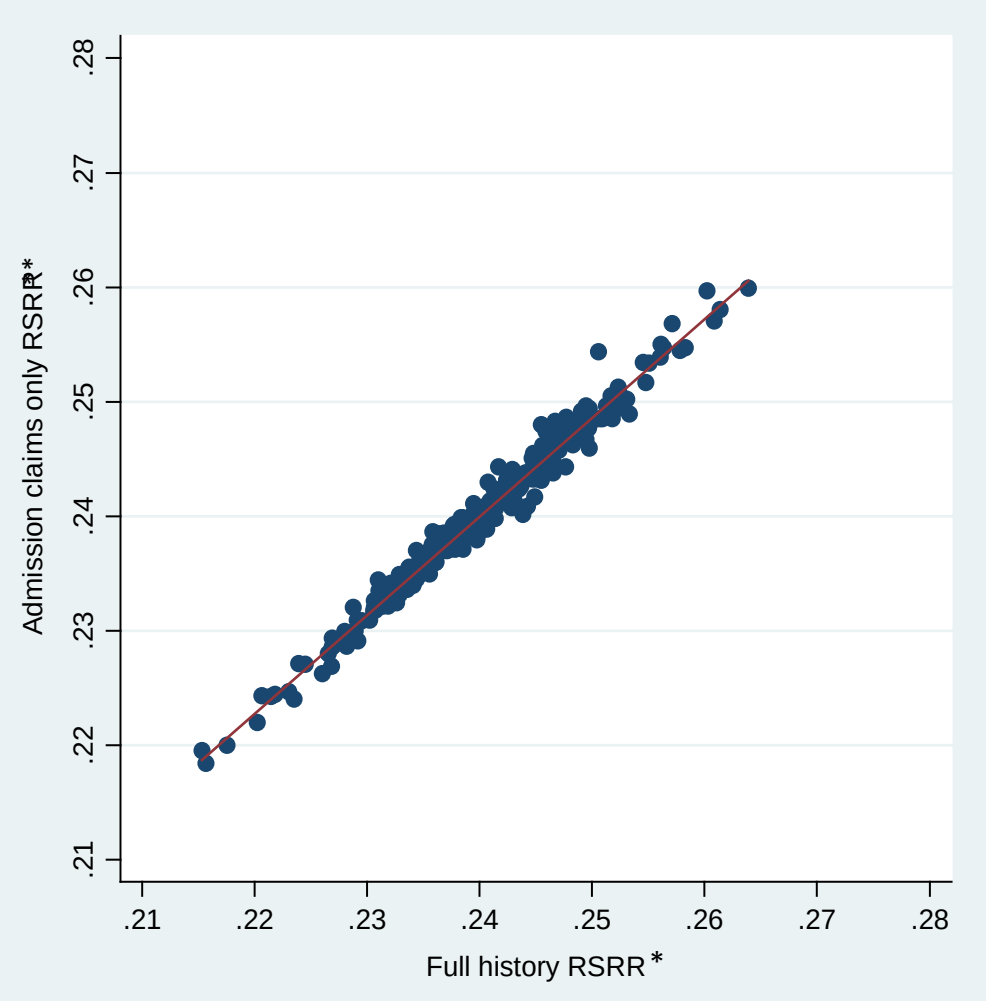
Table 4 e. Performance of HF Readmission Logistic Regression Model With Full Data and With Only Admission Claims Data

Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

	Model with full data*	Model with admission claims data only**
C-statistic	0.610	0.611

Figure 2 e. Scatterplot of HF 30-day Risk-Standardized Readmission Rates (RSRR) 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



Intra-class Correlation Coefficients (ICC): 0.978

Note: 1) RSRRs are in proportions.
2) Diagonal line represents the fitted line.

* Including Part B, hospital outpatient, and hospital inpatient data.
** for both index admission and admissions in the past 12 months.

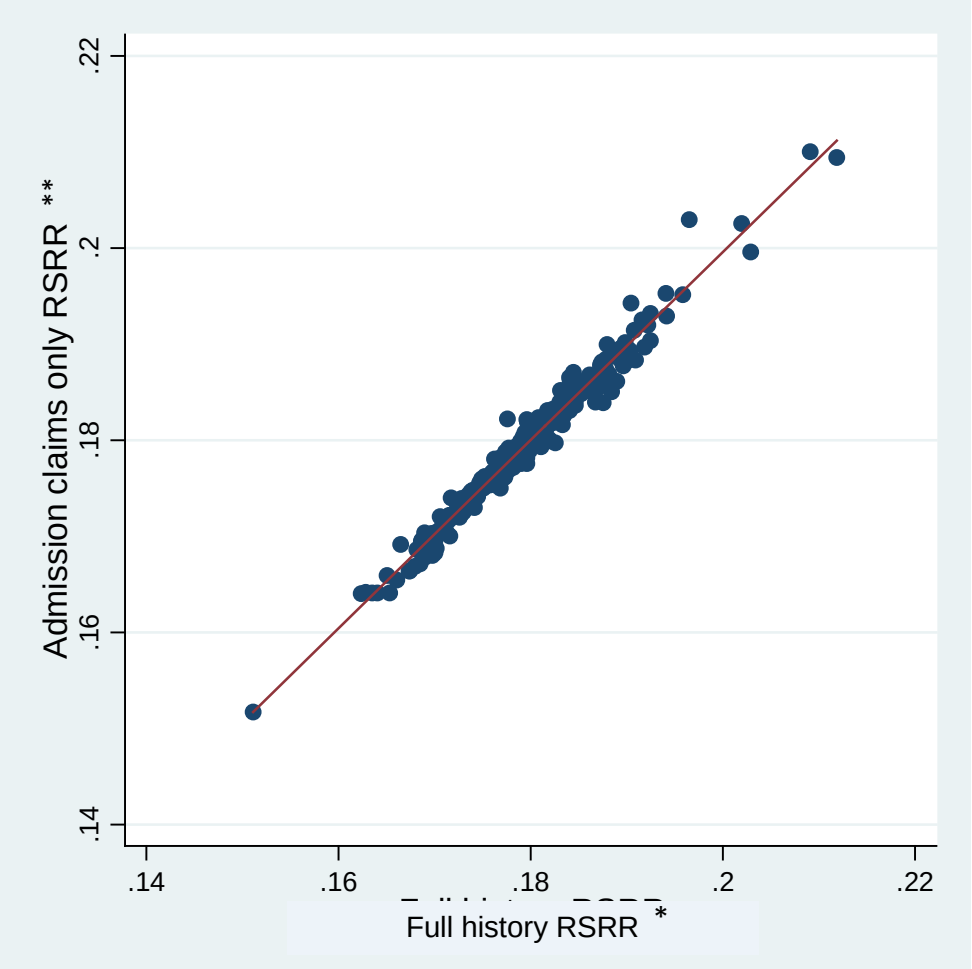
Table 4 f. Performance of Pneumonia Readmission Logistic Regression Model With Full Data and With Only Admission Claims Data

Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

	Model with full data*	Model with admission claims data only**
C-statistic	0.632	0.628

Figure 2 f. Scatterplot of Pneumonia 30-day Risk-Standardized Readmission Rates (RSRR) from Model Using Full Data and from Model Using Only Admission Claims Data (N=342 Hospitals)

Data Source: 2006 CMS Medicare Claims Data for FFS Patients 65+ Admitted to California Hospitals

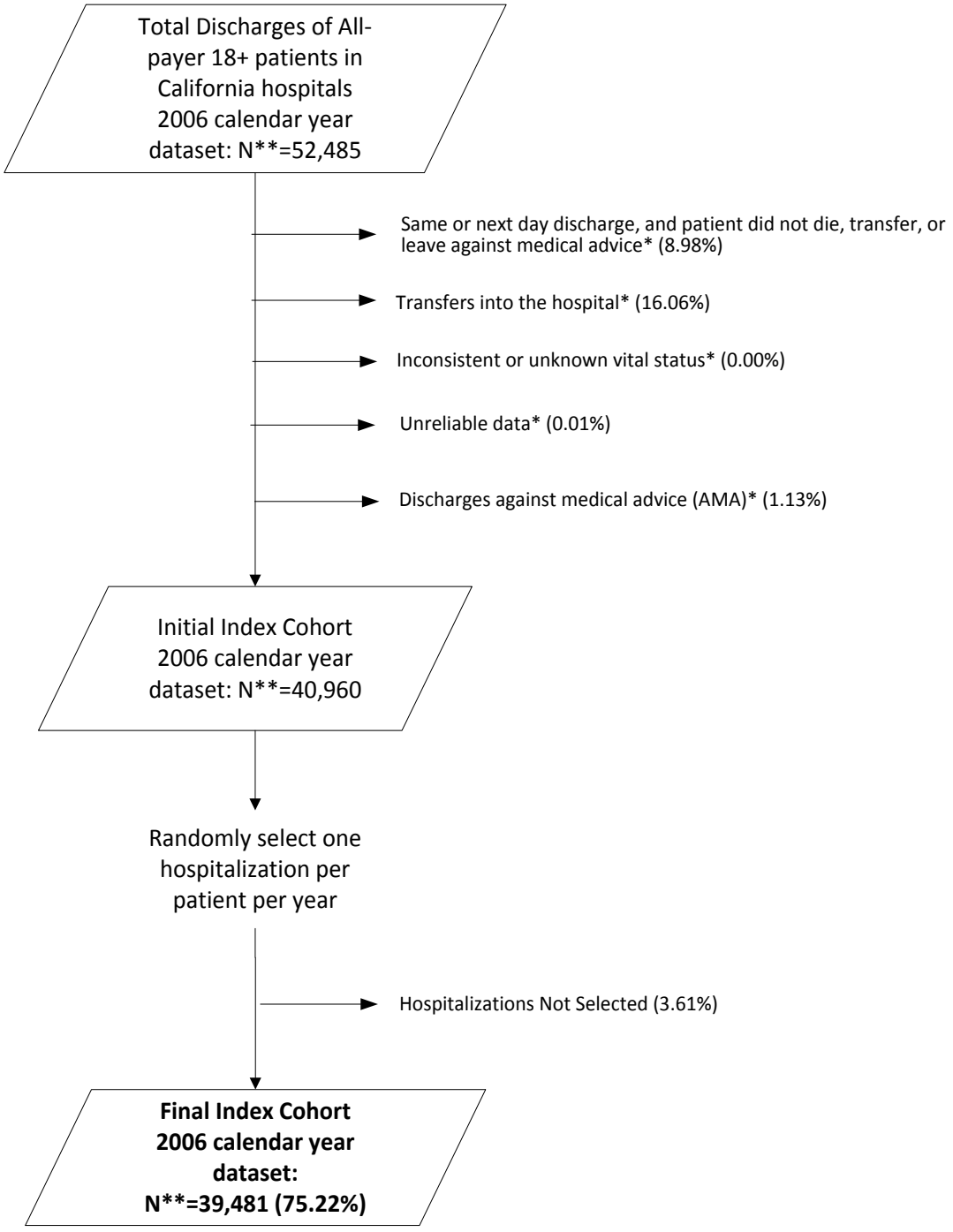


Intra-class Correlation Coefficients (ICC): 0.985

Note: 1) RSRRs are in proportions.
2) Diagonal line represents the fitted line.

* Including Part B, hospital outpatient, and hospital inpatient data.
** for both index admission and admissions in the past 12 months.

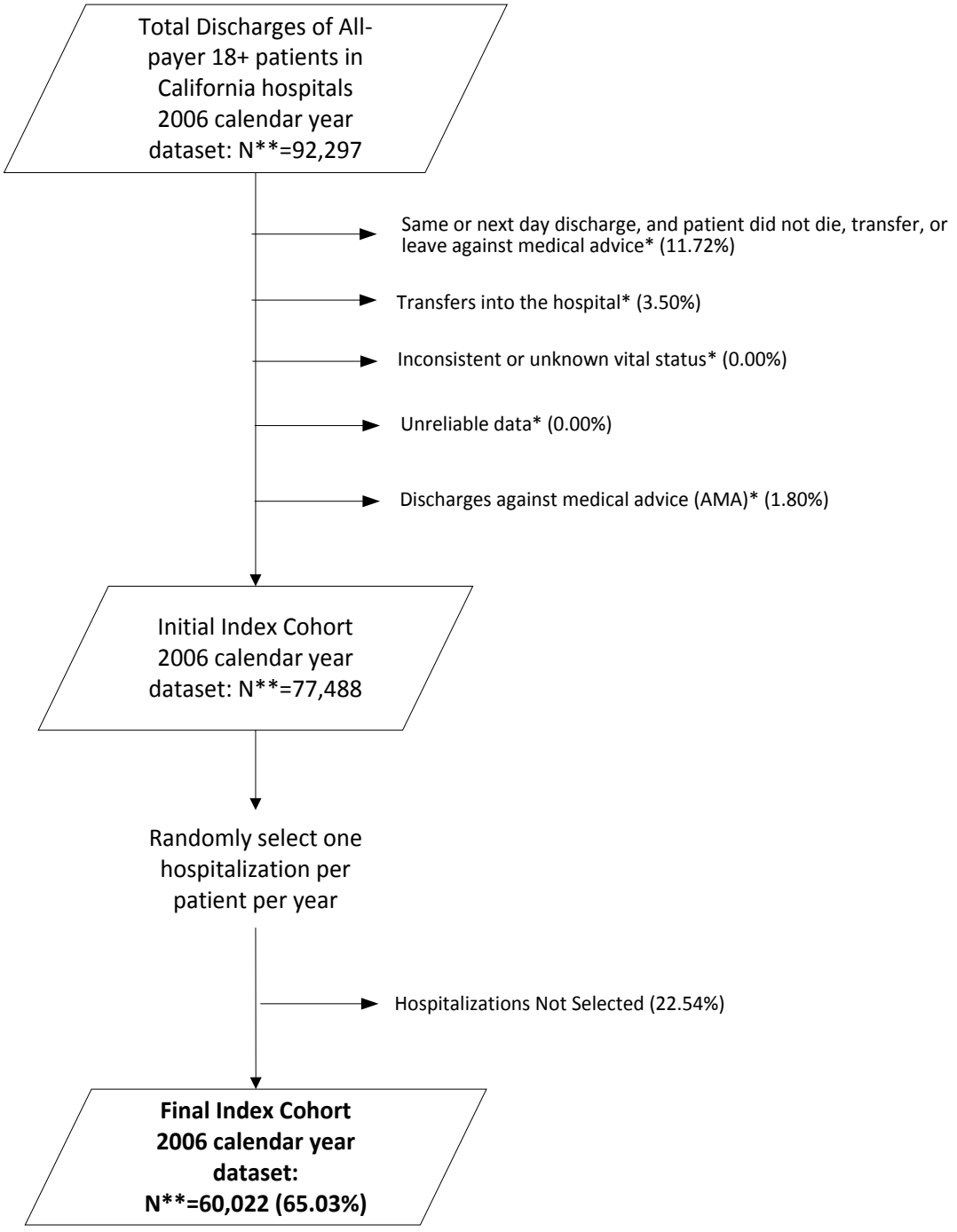
Figure 3 a. 2006 AMI Mortality Cohort Using California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals



*Categories are not mutually exclusive

**N refers to the number of discharges.

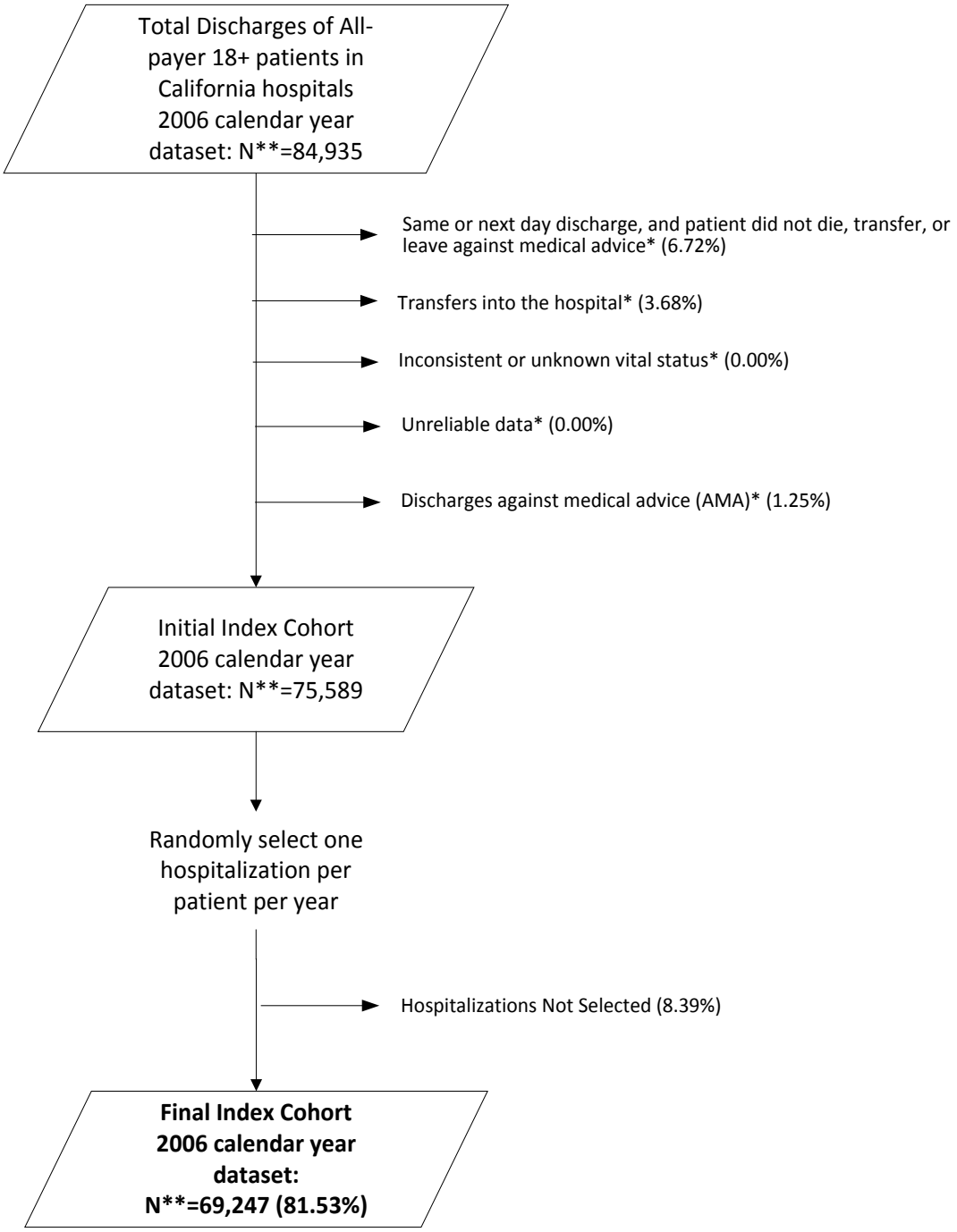
Figure 3 b. 2006 HF Mortality Cohort Using California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals



*Categories are not mutually exclusive

**N refers to the number of discharges.

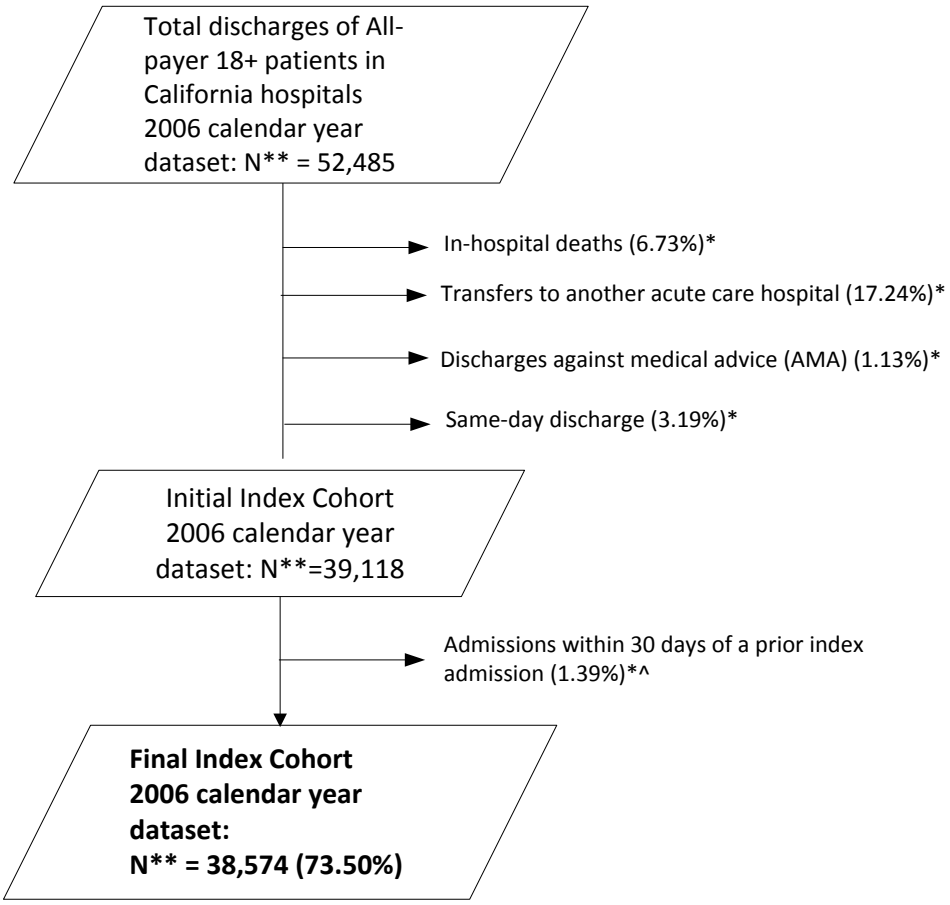
Figure 3 c. 2006 Pneumonia Mortality Cohort Using California Patient Discharge Data for All-payer Patients 18+ Admitted to California Hospitals



*Categories are not mutually exclusive

**N refers to the number of discharges.

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

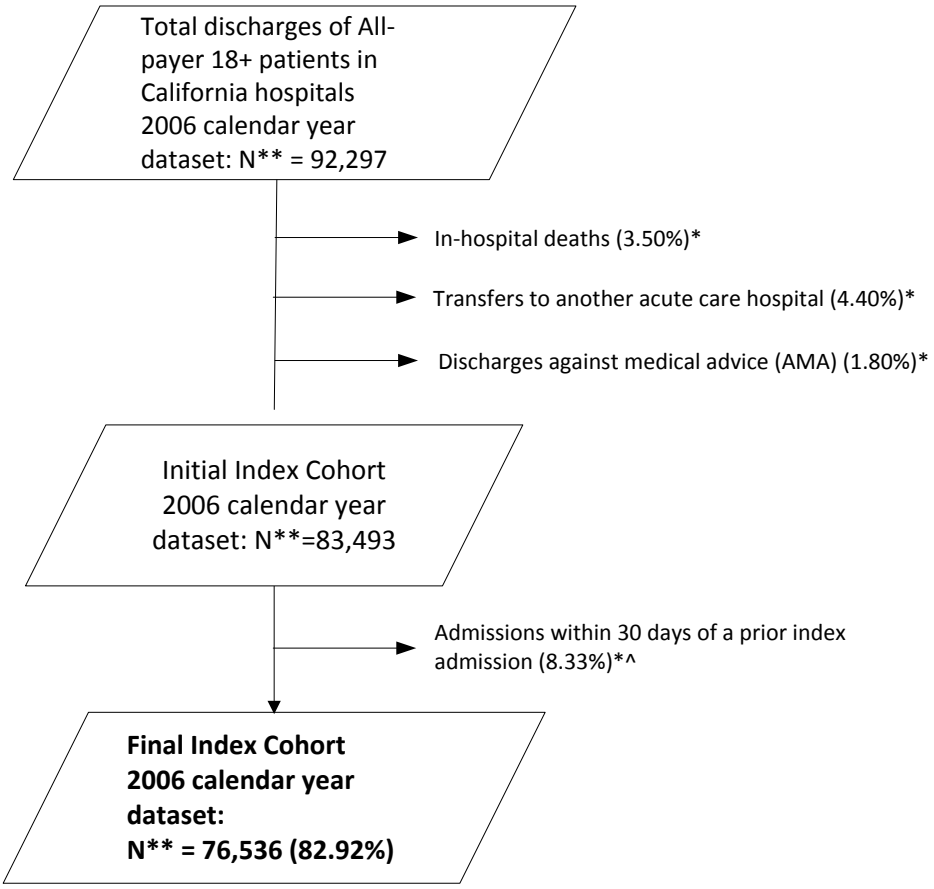


*Categories are not mutually exclusive

**N refers to the number of discharges.

^If a patient has more than one admission within 30 days of discharge from the index hospitalization, only one is counted as a readmission. No admissions within 30 days of discharge from an index admission are considered as additional index admission.

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

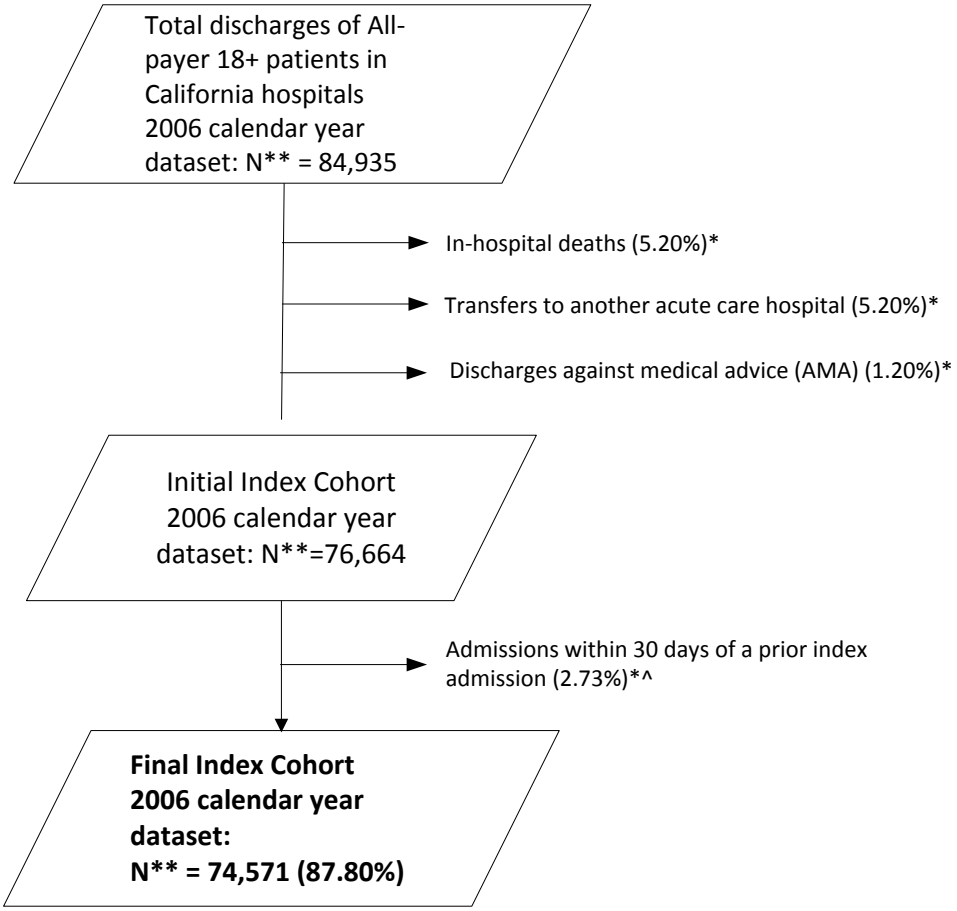


*Categories are not mutually exclusive

**N refers to the number of discharges.

^If a patient has more than one admission within 30 days of discharge from the index hospitalization, only one is counted as a readmission. No admissions within 30 days of discharge from an index admission are considered as additional index admission.

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



*Categories are not mutually exclusive
**N refers to the number of discharges.

^If a patient has more than one admission within 30 days of discharge from the index hospitalization, only one is counted as a readmission. No admissions within 30 days of discharge from an index admission are considered as additional index admission.

Table 5 a. Prevalence of Risk Factors in AMI Mortality Model for All Patients Aged 18+ Years, FFS 65+ Patients, Non-FFS 65+ Patients, and All Patients 18-64 Years of Age

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
	# (%)	# (%)	# (%)	# (%)
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)
Male	23,977 (61)	6,682 (50)	6,099 (54)	11,196 (75)
Cardiovascular				
Percutaneous Transluminal Coronary Angioplasty	4,637 (12)	1,594 (12)	1,290 (12)	1,753 (12)
Coronary Artery Bypass Graft Surgery	3,490 (9)	1,406 (11)	1,337 (12)	747 (5)
Congestive Heart failure (CC 80)	4,829 (12)	2,214 (17)	1,646 (15)	969 (6)
Acute Myocardial Infarction (CC 81)	2,084 (5)	797 (6)	739 (7)	548 (4)
Unstable Angina (CC 82)	1,412 (4)	533 (4)	435 (4)	444 (3)
Anterior Myocardial Infarction (ICD9 410.00-410.19)	5,773 (15)	1,800 (13)	1,280 (11)	2,693 (18)
Other Location of Myocardial Infarction (ICD9 410.20-410.69)	7,715 (20)	2,111 (16)	1,682 (15)	3,922 (26)
Chronic atherosclerosis (CC 83 or 84)	29,221 (74)	10,109 (76)	8,158 (73)	10,954 (73)
Cardio-respiratory failure and shock (CC 79)	1,143 (3)	499 (4)	358 (3)	286 (2)
Valvular or Rheumatic Heart Disease (CC 86)	5,746 (15)	2,733 (20)	2,014 (18)	999 (7)
Comorbidity				
Hypertension (CC 89, 91)	24,388 (62)	8,503 (64)	7,437 (66)	8,448 (57)
Stroke (CC 95 or 96)	618 (2)	279 (2)	229 (2)	110 (1)
Cerebrovascular Disease (CC 97 to 99, 103)	1,698 (4)	817 (6)	621 (6)	260 (2)
Renal Failure (CC 131)	3,378 (9)	1,409 (11)	1,176 (10)	793 (5)
Chronic Obstructive Pulmonary Disease (CC 108)	7,181 (18)	3,175 (24)	2,283 (20)	1,723 (12)
Pneumonia (CC 111 to 113)	4,865 (12)	2,265 (17)	1,657 (15)	943 (6)
Diabetes and DM Complications (CC 15 to 20, 120)	14,462 (37)	5,062 (38)	4,375 (39)	5,025 (34)
Protein-Calorie Malnutrition (CC 21)	1,015 (3)	537 (4)	325 (3)	153 (1)
Dementia and Senility (CC 49 or 50)	3,641 (9)	2,145 (16)	1,359 (12)	137 (1)
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1,230 (3)	527 (4)	387 (3)	316 (2)
Vascular or Circulatory Disease (CC 104, 105)	2,475 (6)	1,102 (8)	849 (8)	524 (4)
Metastatic Cancer and Acute Leukemia (CC 7, 8)	775 (2)	367 (3)	265 (2)	143 (1)
Trauma (CC 154 to 156, 158 to 162)	1,835 (5)	875 (7)	627 (6)	333 (2)
Major Psych Disorders (CC 54 to 56)	1,030 (3)	379 (3)	235 (2)	416 (3)
Liver and Biliary Disease (CC 25 to 27)	634 (2)	152 (1)	112 (1)	370 (2)
Outcome				
Death within 30 days of admission	4,667 (12)	2,257 (17)	1,736 (15)	674 (5)

Note:

1) FFS is defined as payer category=Medicare and payer type of coverage=Traditional.
2) The distribution for all risk factors is significantly different (at the p=0.05 level) across subgroups except for percutaneous transluminal coronary angioplasty (p=0.5670).

Table 5 b. Prevalence of Risk Factors in HF Mortality Model for All Patients Aged 18+ Years, FFS 65+ Patients, Non-FFS 65+ Patients, and All Patients 18-64 Years of Age

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
	# (%)	# (%)	# (%)	# (%)
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)
Male	29,241 (49)	12,120 (43)	7,640 (46)	9,481 (61)
Cardiovascular				
Percutaneous Transluminal Coronary Angioplasty	5,720 (10)	2,937 (10)	1,553 (9)	1,230 (8)
Coronary Artery Bypass Graft Surgery	10,026 (17)	5,435 (19)	3,105 (19)	1,486 (10)
Congestive Heart failure (CC 80)	27,013 (45)	12,826 (46)	7,307 (44)	6,880 (44)
Acute Myocardial Infarction (CC 81)	4,546 (8)	2,056 (7)	1,530 (9)	960 (6)
Unstable Angina (CC 82)	2,829 (5)	1,283 (5)	813 (5)	733 (5)
Chronic atherosclerosis (CC 83, 84)	34,945 (58)	17,884 (64)	10,103 (61)	6,958 (45)
Cardio-respiratory failure and shock (CC 79)	5,696 (9)	2,680 (10)	1,409 (9)	1,607 (10)
Valvular or Rheumatic Heart Disease (CC 86)	17,416 (29)	8,874 (32)	5,252 (32)	3,290 (21)
Comorbidity				
Hypertension (CC 89, 91)	36,660 (61)	17,174 (61)	10,485 (64)	9,001 (58)
Stroke (CC 95, 96)	1,455 (2)	763 (3)	365 (2)	327 (2)
Renal Failure (CC 131)	15,039 (25)	6,835 (24)	4,320 (26)	3,884 (25)
Chronic Obstructive Pulmonary Disease (CC 108)	21,633 (36)	10,944 (39)	5,722 (35)	4,967 (32)
Pneumonia (CC 111 to 113)	16,146 (27)	7,993 (29)	4,500 (27)	3,653 (23)
Diabetes and DM Complications (CC 15 to 20, 120)	28,208 (47)	12,713 (45)	7,511 (46)	7,984 (51)
Protein-Calorie Malnutrition (CC 21)	3,043 (5)	1,569 (6)	857 (5)	617 (4)
Dementia and Senility (CC 49, 50)	7,463 (12)	4,871 (17)	2,342 (14)	250 (2)
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	3,407 (6)	1,619 (6)	826 (5)	962 (6)
Vascular or Circulatory Disease (CC 104, 105)	7,843 (13)	3,845 (14)	2,276 (14)	1,722 (11)
Metastatic Cancer and Acute Leukemia (CC 7, 8)	1,369 (2)	741 (3)	412 (3)	216 (1)
Trauma (CC 154 to 156, 158 to 162)	4,714 (8)	2,573 (9)	1,365 (8)	776 (5)
Major Psych Disorders (CC 54 to 56)	2,646 (4)	1,107 (4)	467 (3)	1,072 (7)
Liver and Biliary Disease (CC 25 to 27)	2,344 (4)	646 (2)	377 (2)	1,321 (8)
Outcome				
Death within 30 days of admission	5,802 (10)	3,176 (11)	2,009 (12)	617 (4)

Note:

1) FFS is defined as payer category=Medicare and payer type of coverage=Traditional.
2) The distribution for all risk factors is significantly different (at the p=0.05 level) across subgroups except for unstable angina (CC 82) (p=0.2285).

Table 5 c. Prevalence of Risk Factors in Pneumonia Mortality Model for All Patients Aged 18+ Years, FFS 65+ Patients, Non-FFS 65+ Patients, and All Patients 18-64 Years of Age

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
	# (%)	# (%)	# (%)	# (%)
All	69,247 (100)	31,580 (100)	16,821 (100)	20,846 (100)
Demographics				
Age: Mean (SD)	71 (17)	81 (8)	80 (8)	50 (11)
Male	32,661 (47)	14,167 (45)	7,894 (47)	10,600 (51)
Cardiovascular				
Percutaneous Transluminal Coronary Angioplasty	2,933 (4)	1,624 (5)	771 (5)	538 (3)
Coronary Artery Bypass Graft Surgery	4,646 (7)	2,731 (9)	1,373 (8)	542 (3)
Congestive Heart failure (CC 80)	12,302 (18)	6,675 (21)	3,193 (19)	2,434 (12)
Acute Myocardial Infarction (CC 81)	1,709 (2)	894 (3)	501 (3)	314 (2)
Unstable Angina (CC 82)	1,146 (2)	555 (2)	297 (2)	294 (1)
Chronic atherosclerosis (CC 83, 84)	20,403 (29)	11,944 (38)	5,512 (33)	2,947 (14)
Cardio-respiratory failure and shock (CC 79)	5,803 (8)	2,700 (9)	1,212 (7)	1,891 (9)
Comorbidity				
Hypertension (CC 89, 91)	39,101 (56)	19,744 (63)	10,749 (64)	8,608 (41)
Stroke (CC 95, 96)	1,531 (2)	869 (3)	404 (2)	258 (1)
Cerebrovascular Disease (CC 97 to 99, 103)	4,109 (6)	2,558 (8)	1,079 (6)	472 (2)
Renal Failure (CC 131)	7,932 (11)	3,874 (12)	2,103 (13)	1,955 (9)
Chronic Obstructive Pulmonary Disease (CC 108)	29,665 (43)	15,260 (48)	7,407 (44)	6,998 (34)
Pneumonia (CC 111 to 113)	13,601 (20)	6,745 (21)	3,033 (18)	3,823 (18)
Protein-Calorie Malnutrition (CC 21)	5,904 (9)	3,096 (10)	1,388 (8)	1,420 (7)
Dementia and Senility (CC 49, 50)	13,100 (19)	8,689 (28)	3,797 (23)	614 (3)
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	4,294 (6)	1,995 (6)	830 (5)	1,469 (7)
Vascular or Circulatory Disease (CC 104, 105)	5,502 (8)	2,938 (9)	1,429 (8)	1,135 (5)
Metastatic Cancer and Acute Leukemia (CC 7, 8)	4,058 (6)	1,821 (6)	1,007 (6)	1,230 (6)
Trauma (CC 154 to 156, 158 to 162)	5,694 (8)	3,080 (10)	1,446 (9)	1,168 (6)
Major Psych Disorders (CC 54 to 56)	4,706 (7)	1,860 (6)	676 (4)	2,170 (10)
Liver and Biliary Disease (CC 25 to 27)	2,467 (4)	538 (2)	273 (2)	1,656 (8)
Severe hematological disorders (CC 44)	1,853 (3)	679 (2)	351(2)	823 (4)
Iron deficiency and other/unspecified anemias and blood disease (CC 47)	28,365 (41)	13,879 (44)	6,972 (41)	7,514 (36)
Depression (CC 58)	10,412 (15)	4,612 (15)	2,290 (14)	3,510 (17)
Parkinson's and Huntington's diseases (CC 73)	1,897 (3)	1,252 (4)	494 (3)	151 (1)
Seizure disorders and convulsions (CC 74)	4,039 (6)	1,543 (5)	656 (4)	1,840 (9)
Fibrosis of lung and other chronic lung disorders (CC 109)	4,729 (7)	2,366 (7)	1,175 (7)	1,188 (6)
Asthma (CC 110)	6,164 (9)	1,906 (6)	1,116 (7)	3,142 (15)
Vertebral fractures (CC 157)	1,433 (2)	864 (3)	399 (2)	170 (1)
Outcome				
Death within 30 days of admission	7,267 (10)	3,970 (13)	2,345 (14)	952 (5)

Note:

1) FFS is defined as payer category=Medicare and payer type of coverage=Traditional.
2) The distribution for all risk factors is significantly different (at the p=0.05 level) across subgroups except for metastatic cancer and acute leukemia (CC 7, 8) (p=0.5908).

Table 5 d. Prevalence of Risk Factors in AMI Readmission Model for All Patients Aged 18+ Years, FFS 65+ Patients, Non-FFS 65+ Patients, and All Patients 18-64 Years of Age

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
	# (%)	# (%)	# (%)	# (%)
All	38,574 (100)	12,360 (100)	10,669 (100)	15,545 (100)
Demographics				
Age: Mean (SD)	68 (14)	79 (8)	78 (8)	54 (8)
Male	23,718 (61)	6,217 (50)	5,828 (55)	11,673 (75)
Cardiovascular				
Percutaneous Transluminal Coronary Angioplasty	5,003 (13)	1,568 (13)	1,388 (13)	2,047 (13)
Coronary Artery Bypass Graft Surgery	3,144 (8)	1,236 (10)	1,179 (11)	729 (5)
Congestive Heart failure (CC 80)	4,640 (12)	2,021 (16)	1,612 (15)	1,007 (6)
Acute coronary syndrome (CC 81, 82)	3,574 (9)	1,238 (10)	1,197 (11)	1,139 (7)
Anterior Myocardial Infarction (ICD9 410.00-410.19)	5,385 (14)	1,548 (13)	1,129 (11)	2,708 (17)
Other Location of Myocardial Infarction (ICD9 410.20-410.69)	7,319 (19)	1,846 (15)	1,485 (14)	3,988 (26)
Angina pectoris/old myocardial infarction (CC 83)	6,758 (18)	2,292 (19)	2,344 (22)	2,122 (14)
Coronary atherosclerosis/other chronic ischemic heart disease (CC 84)	30,965 (80)	9,922 (80)	8,360 (78)	12,683 (82)
Valvular or Rheumatic Heart Disease (CC 86)	5,434 (14)	2,512 (20)	1,907 (18)	1,015 (7)
Arrhythmias (CC 92, 93)	3,780 (10)	1,762 (14)	1,388 (13)	630 (4)
Comorbidity				
Cerebrovascular Disease (CC 97 to 99, 103)	1,599 (4)	729 (6)	600 (6)	270 (2)
Stroke (CC 95, 96)	566 (1)	250 (2)	202 (2)	114 (1)
Vascular or Circulatory Disease (CC 104, 105, 106)	3,198 (8)	1,376 (11)	1,081 (10)	741 (5)
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1,157 (3)	481 (4)	358 (3)	318 (2)
Diabetes and DM Complications (CC 15 to 20, 119, 120)	13,994 (36)	4,660 (38)	4,183 (39)	5,151 (33)
Renal Failure (CC 131)	3,239 (8)	1,297 (10)	1,149 (11)	793 (5)
End-stage renal disease or dialysis (CC 129, 130)	722 (2)	235 (2)	178 (2)	309 (2)
Other urinary tract disorders (CC 136)	4,028 (10)	1,789 (14)	1,410 (13)	829 (5)
Chronic Obstructive Pulmonary Disease (CC 108)	6,823 (18)	2,886 (23)	2,156 (20)	1,781 (11)
Pneumonia (CC 111 to 113)	4,282 (11)	1,937 (16)	1,456 (14)	889 (6)
Asthma (CC 110)	1,416 (4)	395 (3)	373 (3)	648 (4)
Disorders of fluid/electrolyte/acid-base (CC 22, 23)	4,174 (11)	1,855 (15)	1,220 (11)	1,099 (7)
History of infection (CC 1, 3 to 6)	1,902 (5)	799 (6)	563 (5)	540 (3)
Metastatic Cancer and Acute Leukemia (CC 7)	427 (1)	202 (2)	144 (1)	81 (1)
Cancer (CC 8 to 12)	1,923 (5)	866 (7)	702 (7)	355 (2)
Iron deficiency and other/unspecified anemias and blood disease (CC 47)	10,858 (28)	4,628 (37)	3,618 (34)	2,612 (17)
Decubitus ulcer or chronic skin ulcer (CC 148, 149)	863 (2)	319 (3)	299 (3)	245 (2)
Dementia and Senility (CC 49, 50)	3,235 (8)	1,866 (15)	1,241 (12)	128 (1)
Protein-Calorie Malnutrition (CC 21)	874 (2)	449 (4)	297 (3)	128 (1)
Outcome				
Readmission within 30 days of discharge	5,855 (15)	2,206 (18)	1,935 (18)	1,714 (11)

Note:

1) FFS is defined as payer category=Medicare and payer type of coverage=Traditional.
2) The distribution for all risk factors is significantly different (at the p=0.05 level) across subgroups except for percutaneous transluminal coronary angioplasty (p=0.4871) and end-stage renal disease or dialysis (CC 129, 130) (p=0.1653).

Table 5 e. Prevalence of Risk Factors in HF Readmission Model for All Patients Aged 18+ Years, FFS 65+ Patients, Non-FFS 65+ Patients, and All Patients 18-64 Years of Age

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
	# (%)	# (%)	# (%)	# (%)
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)
Male	37,918 (50)	14,833 (44)	9,777 (47)	13,308 (61)
Cardiovascular				
Coronary Artery Bypass Graft Surgery	13,314 (17)	6,913 (20)	4,201 (20)	2,200 (10)
Congestive Heart failure (CC 80)	37,883 (49)	16,853 (50)	10,029 (48)	11,001 (51)
Acute coronary syndrome (CC 81, 82)	8,991 (12)	3,882 (11)	2,743 (13)	2,366 (11)
Arrhythmias (CC 92, 93)	25,928 (34)	13,006 (38)	7,603 (36)	5,319 (24)
Cardio-respiratory failure and shock (CC 79)	7,985 (10)	3,507 (10)	1,967 (9)	2,511 (12)
Valvular or Rheumatic Heart Disease (CC 86)	22,138 (29)	10,905 (32)	6,609 (31)	4,624 (21)
Vascular or Circulatory Disease (CC 104 to 106)	16,245 (21)	7,459 (22)	4,546 (22)	4,240 (19)
Chronic atherosclerosis (CC 83, 84)	45,749 (60)	22,260 (66)	13,229 (63)	10,260 (47)
Other and unspecified heart disease (CC 94)	5,633 (7)	2,302 (7)	1,538 (7)	1,793 (8)
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)
Stroke (CC 95, 96)	1,868 (2)	916 (3)	489 (2)	463 (2)
Renal Failure (CC 131)	20,819 (27)	9,066 (27)	5,819 (28)	5,934 (27)
Chronic Obstructive Pulmonary Disease (CC 108)	27,939 (37)	13,334 (39)	7,337 (35)	7,268 (33)
Diabetes and DM Complications (CC 15 to 20, 119, 120)	36,663 (48)	15,813 (47)	9,703 (46)	11,147 (51)
Disorders of fluid/electrolyte/acid-base (CC 22, 23)	21,763 (28)	10,090 (30)	5,359 (26)	6,314 (29)
Other urinary tract disorders (CC 136)	16,267 (21)	7,823 (23)	4,379 (21)	4,065 (19)
Decubitus ulcer or chronic skin ulcer (CC 148, 149)	4,988 (7)	2,035 (6)	1,331 (6)	1,622 (7)
Other gastrointestinal disorders (CC 36)	26,683 (35)	12,767 (38)	7,274 (35)	6,642 (31)
Peptic ulcer, hemorrhage, other specified gastrointestinal disorders (CC 34)	6,600 (9)	3,286 (10)	1,831 (9)	1,483 (7)
Severe hematological disorders (CC 44)	1,325 (2)	648 (2)	328 (2)	349 (2)
Nephritis (CC 132)	4,955 (6)	1,602 (5)	1,403 (7)	1,950 (9)
Dementia and Senility (CC 49, 50)	8,678 (11)	5,519 (16)	2,801 (13)	358 (2)
Metastatic Cancer and Acute Leukemia (CC 7)	1,001 (1)	520 (2)	292 (1)	189 (1)
Cancer (CC 8 to 12)	5,967 (8)	3,080 (9)	1,850 (9)	1,037 (5)
Liver and biliary disease (CC 25 to 30)	6,737 (9)	2,031 (6)	1,235 (6)	3,471 (16)
End-stage renal disease or dialysis (CC 129, 130)	3,925 (5)	1,392 (4)	750 (4)	1,783 (8)
Asthma (CC 110)	5,423 (7)	1,813 (5)	1,105 (5)	2,505 (12)
Iron deficiency and other/unspecified anemias and blood disease (CC 47)	35,339 (46)	16,765 (50)	9,653 (46)	8,921 (41)
Pneumonia (CC 111 to 113)	20,276 (26)	9,390 (28)	5,547 (26)	5,339 (25)
Drug/alcohol abuse/dependence/psychosis (CC 51 to 53)	15,223 (20)	3,653 (11)	2,288 (11)	9,282 (43)
Major pysch disorders (CC 54 to 56)	3,566 (5)	1,291 (4)	629 (3)	1,646 (8)
Depression (CC 58)	10,059 (13)	4,223 (13)	2,535 (12)	3,301 (15)

Risk Factor	All 18+ (TOTAL)	FFS 65+	Non-FFS 65+	All 18-64
	# (%)	# (%)	# (%)	# (%)
Other psychiatric disorders (CC 60)	5,329 (7)	2,186 (6)	1,278 (6)	1,865 (9)
Fibrosis of lung and other chronic lung disorders (CC 109)	2,945 (4)	1,526 (5)	886 (4)	533 (2)
Protein-Calorie Malnutrition (CC 21)	3,531 (5)	1,752 (5)	938 (4)	841 (4)
Outcome				
Readmission within 30 days of discharge	17,938 (23)	7,922 (23)	4,668 (22)	5,348 (25)

Note:

1) FFS is defined as payer category=Medicare and payer type of coverage=Traditional.
2) The distribution for all risk factors is significantly different (at the p=0.05 level) across subgroups except for renal failure (CC 131) (p=0.0732).

Table 5 f. Prevalence of Risk Factors in Pneumonia Readmission Model for All Patients Aged 18+ Years, FFS 65+ Patients, Non-FFS 65+ Patients, and All Patients 18-64 Years of Age

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
	# (%)	# (%)	# (%)	# (%)
All	74,571 (100)	32,778 (100)	18,353 (100)	23,440 (100)
Demographics				
Age: Mean (SD)	71 (17)	81 (8)	80 (8)	50 (11)
Male	35,456 (48)	14,799 (45)	8,684 (47)	11,973 (51)
Comorbidity				
Coronary Artery Bypass Graft Surgery	5,005 (7)	2,841 (9)	1,554 (8)	610 (3)
History of infection (CC 1, 3 to 6)	10,295 (14)	4,731 (14)	2,020 (11)	3,544 (15)
Septicemia/shock (CC 2)	3,997 (5)	1,899 (6)	771 (4)	1,327 (6)
Metastatic Cancer and Acute Leukemia (CC 7)	2,548 (3)	1,037 (3)	608 (3)	903 (4)
Lung cancer (CC 8)	2,391 (3)	1,067 (3)	634 (3)	690 (3)
Lymphatic, head and neck, brain, and other major cancers; breast, prostate, colorectal and other cancers and tumors (CC 9, 10)	5,025 (7)	2,337 (7)	1,368 (7)	1,320 (6)
Diabetes and DM Complications (CC 15 to 20, 119, 120)	23,175 (31)	10,623 (32)	5,770 (31)	6,782 (29)
Protein-Calorie Malnutrition (CC 21)	5,797 (8)	2,993 (9)	1,325 (7)	1,479 (6)
Disorders of fluid/electrolyte/acid-base (CC 22, 23)	16,805 (23)	8,289 (25)	3,762 (20)	4,754 (20)
Other gastrointestinal disorders (CC 36)	27,483 (37)	13,224 (40)	6,779 (37)	7,480 (32)
Severe hematological disorders (CC 44)	1,868(3)	663 (2)	353 (2)	852 (4)
Iron deficiency and other/unspecified anemias and blood disease (CC 47)	29,825 (40)	14,231 (43)	7,381 (40)	8,213 (35)
Dementia and Senility (CC 49, 50)	13,426 (18)	8,755 (27)	3,978 (22)	693 (3)
Drug/alcohol abuse/dependence/psychosis (CC 51 to 53)	15,209 (20)	4,161 (13)	2,281 (12)	8,767 (37)
Major pysch disorders (CC 54 to 56)	5,200 (7)	1,984 (6)	743 (4)	2,473 (11)
Other psychiatric disorders (CC 60)	5,524 (7)	2,216 (7)	1,187 (6)	2,121 (9)
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	4,633 (6)	2,094 (6)	881 (5)	1,658 (7)
Cardio-respiratory failure and shock (CC 79)	6,544 (9)	2,932 (9)	1,345 (7)	2,267 (10)
Congestive Heart failure (CC 80)	13,436 (18)	7,095 (22)	3,487 (19)	2,854 (12)
Acute coronary syndrome (CC 81, 82)	2,816 (4)	1,388 (4)	781 (4)	647 (3)
Chronic atherosclerosis (CC 83, 84)	21,866 (29)	12,443 (38)	6,091 (33)	3,332 (14)
Valvular or Rheumatic Heart Disease (CC 86)	6,672 (9)	3,738 (11)	1,896 (10)	1,038 (4)
Arrhythmias (CC 92, 93)	12,175 (16)	6,795 (21)	3,469 (19)	1,911 (8)
Stroke (CC 95, 96)	1,595 (2)	897 (3)	417 (2)	281 (1)
Vascular or Circulatory Disease (CC 104 to 106)	9,353 (13)	4,735 (14)	2,266 (12)	2,352 (10)
Chronic Obstructive Pulmonary Disease (CC 108)	32,291 (43)	16,178 (49)	8,153 (44)	7,960 (34)
Fibrosis of lung and other chronic lung disorders (CC 109)	5,176 (7)	2,530 (8)	1,268 (7)	1,378 (6)
Asthma (CC 110)	6,893 (9)	2,022 (6)	1,238 (7)	3,633 (15)
Pneumonia (CC 111 to 113)	15,846 (21)	7,652 (23)	3,518 (19)	4,676 (20)
Pleural effusion/pneumothorax (CC 114)	2,250 (3)	1,039 (3)	478 (3)	733 (3)
Other lung disorders (CC 115)	9,999 (13)	4,556 (14)	2,165 (12)	3,278 (14)

Risk Factor	All 18+ (TOTAL)	FFS 65+	Non-FFS 65+	All 18-64
	# (%)	# (%)	# (%)	# (%)
End-stage renal disease or dialysis (CC 129, 130)	1,640 (2)	588 (2)	339 (2)	713 (3)
Renal Failure (CC 131)	8,536 (11)	4,037 (12)	2,248 (12)	2,251 (10)
Urinary tract infection (CC 135)	8,519 (11)	4,766 (15)	1,944 (11)	1,809 (8)
Other urinary tract disorders (CC 136)	9,731 (13)	5,168 (16)	2,538 (14)	2,025 (9)
Decubitus ulcer or chronic skin ulcer (CC 148, 149)	3,681 (5)	1,794 (5)	861 (5)	1,026 (4)
Vertebral fractures (CC 157)	1,478 (2)	865 (3)	420 (2)	193 (1)
Other injuries (CC 162)	4,183 (6)	2,108 (6)	1,028 (6)	1,047 (4)
Outcome				
Readmission within 30 days of discharge	12,343 (17)	5,751 (18)	3,044 (17)	3,548 (15)

Note:

1) FFS is defined as payer category=Medicare and payer type of coverage=Traditional.
2) The distribution for all risk factors is significantly different (at the p=0.05 level) across subgroups.

Table 6 a. Odds Ratios for Risk Factors in AMI Mortality Measure for All Patients 18+ Years (Logistic Regression Model, 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)
Demographics	
Age	1.05 (1.05-1.06)
Male	1.12 (1.05-1.20)
Cardiovascular	
Percutaneous Transluminal Coronary Angioplasty	0.81 (0.72-0.92)
Coronary Artery Bypass Graft Surgery	1.16 (1.04-1.30)
Congestive Heart failure (CC 80)	1.54 (1.38-1.71)
Acute Myocardial Infarction (CC 81)	1.08 (0.94-1.24)
Unstable Angina (CC 82)	0.76 (0.63-0.92)
Anterior Myocardial Infarction (ICD9 410.00-410.19)	1.74 (1.59-1.91)
Other Location of Myocardial Infarction (ICD9 410.20-410.69)	1.42 (1.30-1.56)
Chronic atherosclerosis (CC 83 or 84)	0.57 (0.53-0.61)
Cardio-respiratory failure and shock (CC 79)	0.88 (0.74-1.04)
Valvular or Rheumatic Heart Disease (CC 86)	1.18 (1.09-1.28)
Comorbidity	
Hypertension (CC 89, 91)	0.70 (0.66-0.75)
Stroke (CC 95 or 96)	1.26 (1.01-1.57)
Cerebrovascular Disease (CC 97 to 99, 103)	1.24 (1.09-1.42)
Renal Failure (CC 131)	1.19 (1.06-1.34)
Chronic Obstructive Pulmonary Disease (CC 108)	1.10 (1.02-1.20)
Pneumonia (CC 111 to 113)	1.60 (1.47-1.74)
Diabetes and DM Complications (CC 15 to 20, 120)	1.27 (1.18-1.36)
Protein-Calorie Malnutrition (CC 21)	1.60 (1.38-1.86)
Dementia and Senility (CC 49 or 50)	1.51 (1.38-1.65)
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1.25 (1.06-1.48)
Vascular or Circulatory Disease (CC 104, 105)	1.12 (0.99-1.27)
Metastatic Cancer and Acute Leukemia (CC 7, 8)	3.08 (2.61-3.62)
Trauma (CC 154 to 156, 158 to 162)	1.12 (0.98-1.27)
Major Psych Disorders (CC 54 to 56)	1.09 (0.90-1.31)
Liver and Biliary Disease (CC 25 to 27)	2.25 (1.81-2.80)

Table 6 b. Odds Ratios of Risk Factors in HF Mortality Measure for All Patients 18+ Years (Logistic Regression Model, 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)
Demographics	
Age	1.04 (1.04-1.05)
Male	1.27 (1.20-1.35)
Cardiovascular	
Percutaneous Transluminal Coronary Angioplasty	0.72 (0.64-0.80)
Coronary Artery Bypass Graft Surgery	0.91 (0.84-0.98)
Congestive Heart failure (CC 80)	1.31 (1.22-1.40)
Acute Myocardial Infarction (CC 81)	1.34 (1.21-1.48)
Unstable Angina (CC 82)	0.81 (0.70-0.93)
Chronic atherosclerosis (CC 83, 84)	1.03 (0.96-1.10)
Cardio-respiratory failure and shock (CC 79)	1.05 (0.96-1.16)
Valvular or Rheumatic Heart Disease (CC 86)	1.17 (1.10-1.24)
Comorbidity	
Hypertension (CC 89, 91)	0.70 (0.66-0.75)
Stroke (CC 95, 96)	1.14 (0.97-1.35)
Renal Failure (CC 131)	1.11 (1.03-1.19)
Chronic Obstructive Pulmonary Disease (CC 108)	1.12 (1.06-1.19)
Pneumonia (CC 111 to 113)	1.30 (1.22-1.38)
Diabetes and DM Complications (CC 15 to 20, 120)	0.89 (0.84-0.95)
Protein-Calorie Malnutrition (CC 21)	1.90 (1.72-2.09)
Dementia and Senility (CC 49, 50)	1.53 (1.42-1.64)
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1.04 (0.92-1.18)
Vascular or Circulatory Disease (CC 104, 105)	1.07 (0.98-1.16)
Metastatic Cancer and Acute Leukemia (CC 7, 8)	2.84 (2.49-3.25)
Trauma (CC 154 to 156, 158 to 162)	1.29 (1.18-1.41)
Major Psych Disorders (CC 54 to 56)	0.93 (0.81-1.07)
Liver and Biliary Disease (CC 25 to 27)	1.44 (1.25-1.66)

Table 6 c. Odds Ratios of Risk Factors in Pneumonia Mortality Measure for All Patients 18+ Years (Logistic Regression Model, N=69,247, C-Statistic=0.759)

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

Risk Factor	OR (95% CI)
Demographics	
Age	1.04 (1.04-1.04)
Male	1.25 (1.19-1.32)
Cardiovascular	
Percutaneous Transluminal Coronary Angioplasty	0.77 (0.66-0.89)
Coronary Artery Bypass Graft Surgery	0.96 (0.86-1.07)
Congestive Heart failure (CC 80)	1.31 (1.21-1.41)
Acute Myocardial Infarction (CC 81)	1.40 (1.21-1.61)
Unstable Angina (CC 82)	0.60 (0.48-0.76)
Chronic atherosclerosis (CC 83, 84)	0.96 (0.90-1.03)
Cardio-respiratory failure and shock (CC 79)	1.10 (1.00-1.21)
Comorbidity	
Hypertension (CC 89, 91)	0.75 (0.71-0.79)
Stroke (CC 95, 96)	1.31 (1.13-1.52)
Cerebrovascular Disease (CC 97 to 99, 103)	0.89 (0.80-0.99)
Renal Failure (CC 131)	1.02 (0.94-1.11)
Chronic Obstructive Pulmonary Disease (CC 108)	0.92 (0.87-0.97)
Pneumonia (CC 111 to 113)	1.09 (1.02-1.17)
Protein-Calorie Malnutrition (CC 21)	2.07 (1.92-2.22)
Dementia and Senility (CC 49, 50)	1.84 (1.73-1.95)
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1.27 (1.15-1.42)
Vascular or Circulatory Disease (CC 104, 105)	1.17 (1.07-1.27)
Metastatic Cancer and Acute Leukemia (CC 7, 8)	4.97 (4.59-5.37)
Trauma (CC 154 to 156, 158 to 162)	1.00 (0.92-1.09)
Major Psych Disorders (CC 54 to 56)	0.86 (0.77-0.96)
Liver and Biliary Disease (CC 25 to 27)	1.70 (1.48-1.95)
Severe hematological disorders (CC 44)	1.41 (1.22-1.61)
Iron deficiency and other/unspecified anemias and blood disease (CC 47)	1.10 (1.05-1.17)
Depression (CC 58)	1.00 (0.93-1.08)
Parkinson's and Huntington's diseases (CC 73)	1.21 (1.07-1.38)
Seizure disorders and convulsions (CC 74)	1.08 (0.97-1.21)
Fibrosis of lung and other chronic lung disorders (CC 109)	1.23 (1.12-1.36)
Asthma (CC 110)	0.66 (0.59-0.75)
Vertebral fractures (CC 157)	1.36 (1.17-1.57)

Table 6 d. Odds Ratios of Risk Factors in AMI Readmission Measure for All Patients 18+ Years (Logistic Regression Model, N=38,574, C-Statistic=0.670)

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

Risk Factor	OR (95% CI)
Demographics	
Age	1.01 (1.01-1.01)
Male	0.80 (0.76-0.85)
Cardiovascular	
Percutaneous Transluminal Coronary Angioplasty	0.97 (0.89-1.06)
Coronary Artery Bypass Graft Surgery	1.02 (0.92-1.13)
Congestive Heart failure (CC 80)	1.24 (1.12-1.37)
Acute coronary syndrome (CC 81, 82)	1.07 (0.97-1.19)
Anterior Myocardial Infarction (ICD9 410.00-410.19)	1.08 (0.99-1.18)
Other Location of Myocardial Infarction (ICD9 410.20-410.69)	0.87 (0.80-0.94)
Angina pectoris/old myocardial infarction (CC 83)	1.02 (0.94-1.11)
Coronary atherosclerosis/other chronic ischemic heart disease (CC 84)	0.97 (0.90-1.04)
Valvular or Rheumatic Heart Disease (CC 86)	1.16 (1.08-1.26)
Arrhythmias (CC 92, 93)	1.04 (0.94-1.14)
Comorbidity	
Cerebrovascular Disease (CC 97 to 99, 103)	0.92 (0.81-1.06)
Stroke (CC 95, 96)	1.08 (0.87-1.34)
Vascular or Circulatory Disease (CC 104, 105, 106)	1.27 (1.14-1.40)
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1.20 (1.03-1.39)
Diabetes and DM Complications (CC 15 to 20, 119, 120)	1.36 (1.28-1.44)
Renal Failure (CC 131)	1.14 (1.02-1.27)
End-stage renal disease or dialysis (CC 129, 130)	1.37 (1.14-1.64)
Other urinary tract disorders (CC 136)	1.15 (1.05-1.25)
Chronic Obstructive Pulmonary Disease (CC 108)	1.21 (1.13-1.30)
Pneumonia (CC 111 to 113)	1.14 (1.05-1.25)
Asthma (CC 110)	1.14 (0.99-1.31)
Disorders of fluid/electrolyte/acid-base (CC 22, 23)	1.15 (1.05-1.26)
History of infection (CC 1, 3 to 6)	1.02 (0.91-1.16)
Metastatic Cancer and Acute Leukemia (CC 7)	1.51 (1.19-1.92)
Cancer (CC 8 to 12)	1.16 (1.02-1.32)
Iron deficiency and other/unspecified anemias and blood disease (CC 47)	1.35 (1.27-1.45)
Decubitus ulcer or chronic skin ulcer (CC 148, 149)	1.07 (0.91-1.27)
Dementia and Senility (CC 49, 50)	0.98 (0.88-1.08)
Protein-Calorie Malnutrition (CC 21)	1.14 (0.97-1.34)

Table 6 e. Odds Ratios of Risk Factors in HF Readmission Measure for All Patients 18+ Years (Logistic Regression Model, 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)
Demographics	
Age	1.00 (1.00-1.00)
Male	1.02 (0.99-1.06)
Cardiovascular	
Coronary Artery Bypass Graft Surgery	0.97 (0.92-1.01)
Congestive Heart failure (CC 80)	1.22 (1.16-1.27)
Acute coronary syndrome (CC 81, 82)	1.04 (0.99-1.10)
Arrhythmias (CC 92, 93)	1.09 (1.05-1.14)
Cardio-respiratory failure and shock (CC 79)	1.10 (1.04-1.16)
Valvular or Rheumatic Heart Disease (CC 86)	1.08 (1.04-1.12)
Vascular or Circulatory Disease (CC 104, 105, 106)	1.06 (1.01-1.11)
Chronic atherosclerosis (CC 83, 84)	1.14 (1.10-1.19)
Other and unspecified heart disease (CC 94)	1.03 (0.97-1.10)
Comorbidity	
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1.07 (1.00-1.15)
Stroke (CC 95, 96)	1.05 (0.94-1.16)
Renal Failure (CC 131)	1.13 (1.08-1.18)
Chronic Obstructive Pulmonary Disease (CC 108)	1.13 (1.09-1.18)
Diabetes and DM Complications (CC 15 to 20, 119, 120)	1.12 (1.08-1.16)
Disorders of fluid/electrolyte/acid-base (CC22, 23)	1.20 (1.15-1.25)
Other urinary tract disorders (CC 136)	1.15 (1.10-1.20)
Decubitus ulcer or chronic skin ulcer (CC 148, 149)	1.12 (1.05-1.20)
Other gastrointestinal disorders (CC 36)	1.10 (1.06-1.14)
Peptic ulcer, hemorrhage, other specified gastrointestinal disorders (CC 34)	1.02 (0.96-1.08)
Severe hematological disorders (CC 44)	1.23 (1.09-1.39)
Nephritis (CC 132)	0.99 (0.93-1.07)
Dementia and Senility (CC 49, 50)	0.97 (0.92-1.03)
Metastatic Cancer and Acute Leukemia (CC 7)	1.16 (1.00-1.35)
Cancer (CC 8 to 12)	1.02 (0.96-1.09)
Liver and biliary disease (CC 25 to 30)	1.20 (1.13-1.27)
End-stage renal disease or dialysis (CC 129, 130)	1.39 (1.29-1.50)
Asthma (CC 110)	1.05 (0.98-1.12)
Iron deficiency and other/unspecified anemias and blood disease (CC 47)	1.18 (1.13-1.23)
Pneumonia (CC 111 to 113)	1.06 (1.02-1.11)
Drug/alcohol abuse/dependence/psychosis (CC 51 to 53)	1.12 (1.07-1.17)
Major pysch disorders (CC 54 to 56)	1.28 (1.18-1.38)
Depression (CC 58)	1.06 (1.01-1.11)
Other psychiatric disorders (CC 60)	1.18 (1.10-1.25)
Fibrosis of lung and other chronic lung disorders (CC 109)	1.13 (1.04-1.23)
Protein-Calorie Malnutrition (CC 21)	1.04 (0.96-1.13)

Table 6 f. Odds Ratios of Risk Factors in Pneumonia Readmission Measure for All Patients 18+ Years (Logistic Regression Model, N=74,571, C-Statistic=0.666)

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

Description	OR (95% CI)
Demographics	
Age	1.00 (1.00-1.00)
Male	1.09 (1.05-1.14)
Comorbidity	
Coronary Artery Bypass Graft Surgery	0.84 (0.77-0.92)
History of infection (CC 1, 3 to 6)	1.19 (1.12-1.26)
Septicemia/shock (CC 2)	1.00 (0.92-1.08)
Metastatic Cancer and Acute Leukemia (CC 7)	1.57 (1.41-1.74)
Lung cancer (CC 8)	1.41 (1.27-1.57)
Lymphatic, head and neck, brain, and other major cancers; breast, prostate, colorectal and other cancers and tumors (CC 9, 10)	1.17 (1.08-1.26)
Diabetes and DM Complications (CC 15 to 20, 119, 120)	1.12 (1.07-1.17)
Protein-Calorie Malnutrition (CC 21)	1.22 (1.14-1.30)
Disorders of fluid/electrolyte/acid-base (CC 22, 23)	1.15 (1.09-1.22)
Other gastrointestinal disorders (CC 36)	1.15 (1.10-1.20)
Severe hematological disorders (CC 44)	1.57 (1.41-1.75)
Iron deficiency and other/unspecified anemias and blood disease (CC 47)	1.18 (1.13-1.23)
Dementia and Senility (CC 49, 50)	1.08 (1.03-1.14)
Drug/alcohol abuse/dependence/psychosis (CC 51 to 53)	1.03 (0.98-1.09)
Major pysch disorders (CC 54 to 56)	1.25 (1.17-1.35)
Other psychiatric disorders (CC 60)	1.18 (1.10-1.27)
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1.15 (1.06-1.25)
Cardio-respiratory failure and shock (CC 79)	1.11 (1.04-1.19)
Congestive Heart failure (CC 80)	1.18 (1.11-1.25)
Acute coronary syndrome (CC 81, 82)	1.12 (1.02-1.23)
Chronic atherosclerosis (CC 83, 84)	1.13 (1.07-1.19)
Valvular or Rheumatic Heart Disease (CC 86)	1.12 (1.05-1.20)
Arrhythmias (CC 92, 93)	1.02 (0.96-1.08)
Stroke (CC 95, 96)	0.95 (0.84-1.08)
Vascular or Circulatory Disease (CC 104, 105, 106)	1.04 (0.98-1.11)
Chronic Obstructive Pulmonary Disease (CC 108)	1.24 (1.19-1.30)
Fibrosis of lung and other chronic lung disorders (CC 109)	1.22 (1.14-1.32)
Asthma (CC 110)	0.95 (0.88-1.02)
Pneumonia (CC 111 to 113)	1.18 (1.12-1.25)
Pleural effusion/pneumothorax (CC 114)	1.05 (0.95-1.17)
Other lung disorders (CC 115)	1.05 (1.00-1.12)
End-stage renal disease or dialysis (CC 129, 130)	1.47 (1.30-1.66)
Renal Failure (CC 131)	1.16 (1.09-1.24)
Urinary tract infection (CC 135)	1.09 (1.02-1.17)
Other urinary tract disorders (CC 136)	1.08 (1.02-1.14)
Decubitus ulcer or chronic skin ulcer (CC 148, 149)	1.10 (1.01-1.19)
Vertebral fractures (CC 157)	1.23 (1.09-1.40)
Other injuries (CC 162)	1.15 (1.07-1.25)

Table 7 a. 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	Unadjusted Mortality Rate (%)	C-statistic	SE	Lower C-stat	Upper C-stat	Predictive ability[#], % (lowest decile – highest decile)
All 65+	24,561	16.3	0.714	0.004	0.705	0.722	(0.00%, 34.77%)
FFS, 65+	13,347	16.9	0.712	0.006	0.701	0.723	(0.00%, 35.20%)
Non-FFS, 65+	11,214	15.5	0.715	0.007	0.702	0.728	(0.00%, 34.11%)
All 18-64	14,920	4.5	0.728	0.010	0.708	0.748	(1.47%, 31.15%)
All 18+ (overall)	**39,481**	**11.8**	**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.

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

Table 7 b. HF 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	Unadjusted Mortality Rate (%)	C-statistic	SE	Lower C-stat	Upper C-stat	Predictive ability[#], % (lowest decile – highest decile)
All 65+	44,424	11.7	0.690	0.004	0.683	0.698	(2.31%, 25.26%)
FFS, 65+	27,977	11.4	0.690	0.005	0.681	0.700	(0.00%, 24.17%)
Non-FFS, 65+	16,447	12.2	0.693	0.006	0.680	0.705	(5.17%, 27.41%)
All 18-64	15,598	4.0	0.663	0.011	0.641	0.685	(1.96%, 14.06%)
All 18+ (overall)	**60,022**	**9.7**	**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 7 c. Pneumonia 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	Unadjusted Mortality Rate (%)	C-statistic	SE	Lower C-stat	Upper C-stat	Predictive ability[#], % (lowest decile – highest decile)
All 65+	48,401	13.0	0.719	0.003	0.713	0.726	(0.00%, 30.51%)
FFS, 65+	31,580	12.6	0.719	0.004	0.711	0.727	(0.00%, 28.84%)
Non-FFS, 65+	16,821	13.9	0.723	0.006	0.712	0.734	(0.00%, 34.20%)
All 18-64	20,846	4.6	0.776	0.008	0.759	0.792	(1.27%, 31.07%)
All 18+ (overall)	**69,247**	**10.5**	**0.759**	**0.003**	**0.753**	**0.764**	**(1.26%, 30.65%)**

*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 7 d. AMI Readmission 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	Unadjusted Readmission Rate (%)	C-statistic	SE	Lower C-stat	Upper C-stat	Predictive ability[#], % (lowest decile – highest decile)
All 65+	23,029	18.0	0.627	0.005	0.618	0.636	(6.67%, 28.99%)
FFS, 65+	12,360	17.8	0.625	0.006	0.612	0.637	(7.58%, 27.59%)
Non-FFS, 65+	10,669	18.1	0.630	0.007	0.617	0.644	(5.56%, 30.92%)
All 18-64	15,545	11.0	0.682	0.007	0.668	0.696	(5.41%, 39.25%)
All 18+ (overall)	**38,574**	**15.2**	**0.670**	**0.004**	**0.662**	**0.677**	**(5.45%, 30.41%)**

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

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

Table 7 e. HF Readmission 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	Unadjusted Readmission Rate (%)	C-statistic	SE	Lower C-stat	Upper C-stat	Predictive ability[#], % (lowest decile – highest decile)
All 65+	54,773	23.0	0.616	0.003	0.610	0.622	(13.89%, 39.14%)
FFS, 65+	33,784	23.4	0.617	0.004	0.610	0.624	(14.15%, 39.42%)
Non-FFS, 65+	20,989	22.2	0.614	0.005	0.604	0.623	(13.53%, 38.58%)
All 18-64	21,763	24.6	0.687	0.004	0.679	0.695	(9.93%, 49.41%)
All 18+ (overall)	**76,536**	**23.4**	**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 readmission in the lowest and the highest decile of the predicted readmission.

Table 7 f. Pneumonia Readmission 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	Unadjusted Readmission Rate (%)	C-statistic	SE	Lower C-stat	Upper C-stat	Predictive ability[#], % (lowest decile – highest decile)
All 65+	51,131	17.2	0.637	0.003	0.631	0.644	(7.90%, 32.33%)
FFS, 65+	32,778	17.5	0.641	0.004	0.633	0.649	(8.14%, 32.21%)
Non-FFS, 65+	18,353	16.6	0.630	0.006	0.619	0.641	(7.55%, 32.61%)
All 18-64	23,440	15.1	0.720	0.005	0.711	0.729	(5.69%, 41.86%)
All 18+ (overall)	**74,571**	**16.6**	**0.666**	**0.003**	**0.661**	**0.671**	**(6.44%, 34.81%)**

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

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

Table 8 a. 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 8 b. 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	-0.002	-0.005	-0.021	0.022	0.008
Std Deviation	0.995	0.984	0.965	1.017	1.024
100% Max	13.399	6.746	5.975	6.746	13.399
99%	4.204	3.739	3.692	3.830	5.743
95%	2.543	2.616	2.549	2.708	-0.095
90%	-0.097	1.760	1.667	1.878	-0.118
75% Q3	-0.188	-0.241	-0.243	-0.237	-0.148
50% Median	-0.269	-0.307	-0.310	-0.301	-0.178
25% Q1	-0.356	-0.386	-0.391	-0.376	-0.214
10%	-0.451	-0.480	-0.487	-0.466	-0.259
5%	-0.521	-0.551	-0.558	-0.537	-0.296
1%	-0.702	-0.740	-0.749	-0.722	-0.405
0% Min	-1.680	-1.680	-1.680	-1.668	-0.709

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 8 c. Distribution of Pearson Chi-Square Residuals for Pneumonia 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	69,247	48,401	31,580	16,821	20,846
Mean	-0.006	-0.006	-0.030	0.039	-0.004
Std Deviation	0.977	0.984	0.957	1.030	0.963
100% Max	14.921	6.268	6.268	5.508	14.921
99%	4.028	3.735	3.634	3.863	5.292
95%	2.398	2.528	2.451	2.683	-0.080
90%	1.097	1.681	1.582	1.843	-0.105
75% Q3	-0.174	-0.235	-0.239	-0.229	-0.137
50% Median	-0.259	-0.301	-0.307	-0.291	-0.171
25% Q1	-0.356	-0.398	-0.408	-0.380	-0.210
10%	-0.483	-0.524	-0.535	-0.500	-0.274
5%	-0.579	-0.629	-0.642	-0.598	-0.361
1%	-0.851	-0.901	-0.915	-0.885	-0.553
0% Min	-2.242	-2.242	-2.242	-1.963	-1.353

Residual < -2	5 (0.01%)	5 (0.01%)	5 (0.02%)	0 (0.00%)	0 (0.00%)
-2 <= Residual < 0	61,975 (89.50%)	42,081 (86.94%)	27,605 (87.41%)	14,476 (86.06%)	19,894 (95.43%)
0 <= Residual < 2	2,549 (3.68%)	2,390 (4.94%)	1,559 (4.94%)	831 (4.94%)	159 (0.76%)
Residual >= 2	4,718 (6.81%)	3,925 (8.11%)	2,411 (7.63%)	1,514 (9.00%)	793 (3.80%)

Table 8 d. Distribution of Pearson Chi-Square Residuals for AMI Readmission Models by Patient Subgroups

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

Description	All 18+ (TOTAL)	All 65+	FFS 65+	Non-FFS 65+	All 18-64
N	38,574	23,029	12,360	10,669	15,545
Mean	-0.002	0.006	-0.006	0.020	-0.015
Std Deviation	0.992	1.012	1.004	1.022	0.960
100% Max	4.248	3.486	3.486	3.429	4.248
99%	3.256	2.921	2.914	2.937	3.489
95%	2.528	2.433	2.403	2.467	2.809
90%	1.983	2.046	2.022	2.086	1.551
75% Q3	-0.293	-0.327	-0.330	-0.325	-0.282
50% Median	-0.355	-0.396	-0.401	-0.391	-0.310
25% Q1	-0.436	-0.478	-0.487	-0.469	-0.356
10%	-0.543	-0.594	-0.607	-0.579	-0.418
5%	-0.635	-0.683	-0.699	-0.666	-0.479
1%	-0.832	-0.867	-0.881	-0.849	-0.694
0% Min	-1.319	-1.319	-1.272	-1.319	-1.194

Residual < -2	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
-2 <= Residual < 0	32,719 (84.82%)	18,888 (82.02%)	10,154 (82.15%)	8,734 (81.86%)	13,831 (88.97%)
0 <= Residual < 2	2,043 (5.30%)	1,676 (7.28%)	926 (7.49%)	750 (7.03%)	367 (2.36%)
Residual >= 2	3,812 (9.88%)	2,465 (10.70%)	1,280 (10.36%)	1,185 (11.11%)	1,347 (8.67%)

Table 8 e. Distribution of Pearson Chi-Square Residuals 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	0.000	0.002	0.006	-0.005	-0.005
Std Deviation	1.000	1.009	1.011	1.004	0.978
100% Max	2.755	2.755	2.755	2.747	2.647
99%	2.503	2.518	2.512	2.526	2.450
95%	2.172	2.196	2.189	2.210	2.095
90%	1.824	1.858	1.851	1.871	1.732
75% Q3	-0.378	-0.377	-0.375	-0.379	-0.380
50% Median	-0.454	-0.455	-0.457	-0.452	-0.451
25% Q1	-0.570	-0.569	-0.574	-0.563	-0.570
10%	-0.695	-0.688	-0.694	-0.678	-0.713
5%	-0.773	-0.761	-0.768	-0.750	-0.807
1%	-0.934	-0.907	-0.913	-0.898	-0.990
0% Min	-1.508	-1.477	-1.250	-1.477	-1.508

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 8 f. Distribution of Pearson Chi-Square Residuals for Pneumonia Readmission 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	74,571	51,131	32,778	18,353	23,440
Mean	-0.002	0.003	0.000	0.008	-0.012
Std Deviation	0.994	1.010	1.008	1.014	0.959
100% Max	3.616	3.395	3.395	3.395	3.616
99%	3.055	2.999	2.981	3.025	3.163
95%	2.537	2.540	2.506	2.590	2.529
90%	1.961	2.017	1.986	2.084	1.809
75% Q3	-0.317	-0.326	-0.327	-0.325	-0.306
50% Median	-0.367	-0.378	-0.381	-0.373	-0.345
25% Q1	-0.447	-0.461	-0.469	-0.447	-0.410
10%	-0.573	-0.589	-0.600	-0.565	-0.531
5%	-0.665	-0.682	-0.698	-0.651	-0.624
1%	-0.874	-0.887	-0.909	-0.844	-0.837
0% Min	-1.936	-1.849	-1.558	-1.849	-1.936

Residual < -2	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
-2 <= Residual < 0	62,228 (83.45%)	42,336 (82.80%)	27,027 (82.45%)	15,309 (83.41%)	19,892 (84.86%)
0 <= Residual < 2	5,137 (6.89%)	3,615 (7.07%)	2,506 (7.65%)	1,109 (6.04%)	1,522 (6.49%)
Residual >= 2	7,206 (9.66%)	5,180 (10.13%)	3,245 (9.90%)	1,935 (10.54%)	2,026 (8.64%)

Table 9 a. Odds Ratios for Risk Factors in AMI Mortality Measure -- Stratified Results for FFS Patients 65+, Non-FFS Patients 65+, All Patients 65+, and All Patients 18-64 Years of Age

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

Risk Factor	OR (95% CI) for All 65+ (N=24,561, C-statistic=0.714)	OR (95% CI) for FFS 65+ (N=13,347, C-statistic=0.713)	OR (95% CI) for Non-FFS 65+ (N= 11,214, C-statistic=0.719)	OR (95% CI) for All 18-64 (N=14,920, C-statistic=0.753)
Demographics				
Age	1.06 (1.05-1.06)	1.06 (1.05-1.06)	1.06 (1.05-1.07)	1.04 (1.02-1.05)
Male	1.16 (1.08-1.25)	1.17 (1.06-1.29)	1.16 (1.04-1.30)	1.06 (0.88-1.27)
Cardiovascular				
Percutaneous Transluminal Coronary Angioplasty	0.80 (0.70-0.91)	0.77 (0.65-0.92)	0.82 (0.68-1.00)	0.86 (0.65-1.15)
Coronary Artery Bypass Graft Surgery	1.15 (1.03-1.30)	1.24 (1.06-1.45)	1.05 (0.88-1.26)	1.16 (0.82-1.65)
Congestive Heart failure (CC 80)	1.58 (1.41-1.77)	1.70 (1.46-1.96)	1.42 (1.19-1.70)	1.24 (0.90-1.71)
Acute Myocardial Infarction (CC 81)	1.04 (0.89-1.21)	1.00 (0.81-1.23)	1.09 (0.87-1.36)	1.37 (0.94-2.01)
Unstable Angina (CC 82)	0.79 (0.65-0.97)	0.90 (0.70-1.17)	0.67 (0.49-0.93)	0.63 (0.39-1.03)
Anterior Myocardial Infarction (ICD9 410.00-410.19)	1.71 (1.54-1.90)	1.67 (1.46-1.92)	1.81 (1.54-2.12)	1.96 (1.59-2.41)
Other Location of Myocardial Infarction (ICD9 410.20-410.69)	1.50 (1.36-1.66)	1.53 (1.34-1.76)	1.47 (1.26-1.72)	1.29 (1.05-1.59)
Chronic atherosclerosis (CC 83 or 84)	0.60 (0.55-0.65)	0.54 (0.49-0.61)	0.68 (0.60-0.77)	0.44 (0.37-0.53)
Cardio-respiratory failure and shock (CC 79)	0.86 (0.71-1.04)	0.89 (0.69-1.13)	0.83 (0.62-1.12)	0.92 (0.61-1.40)
Valvular or Rheumatic Heart Disease (CC 86)	1.12 (1.03-1.23)	1.01 (0.90-1.14)	1.29 (1.13-1.48)	1.79 (1.39-2.29)
Comorbidity				
Hypertension (CC 89, 91)	0.71 (0.65-0.76)	0.69 (0.63-0.76)	0.72 (0.65-0.81)	0.71 (0.60-0.84)
Stroke (CC 95 or 96)	1.31 (1.04-1.65)	1.08 (0.78-1.49)	1.63 (1.16-2.28)	0.91 (0.45-1.85)
Cerebrovascular Disease (CC 97 to 99, 103)	1.27 (1.11-1.47)	1.39 (1.16-1.67)	1.13 (0.91-1.42)	1.12 (0.69-1.80)
Renal Failure (CC 131)	1.11 (0.98-1.25)	1.20 (1.02-1.41)	0.99 (0.82-1.20)	1.70 (1.23-2.35)
Chronic Obstructive Pulmonary Disease (CC 108)	1.10 (1.01-1.20)	1.05 (0.94-1.18)	1.15 (1.01-1.32)	1.17 (0.93-1.46)
Pneumonia (CC 111 to 113)	1.53 (1.39-1.68)	1.54 (1.37-1.74)	1.52 (1.32-1.75)	2.08 (1.63-2.66)
Diabetes and DM Complications (CC 15 to 20, 120)	1.19 (1.10-1.28)	1.24 (1.12-1.37)	1.14 (1.02-1.28)	1.73 (1.46-2.06)
Protein-Calorie Malnutrition (CC 21)	1.53 (1.31-1.80)	1.28 (1.04-1.57)	2.05 (1.59-2.65)	2.05 (1.32-3.17)
Dementia and Senility (CC 49 or 50)	1.51 (1.38-1.66)	1.43 (1.27-1.62)	1.64 (1.42-1.89)	1.63 (0.94-2.84)
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1.23 (1.03-1.48)	1.21 (0.95-1.54)	1.26 (0.96-1.67)	1.06 (0.70-1.62)
Vascular or Circulatory Disease (CC 104, 105)	1.07(0.94-1.22)	0.97 (0.81-1.16)	1.24 (1.01-1.52)	1.47 (1.04-2.08)
Metastatic Cancer and Acute Leukemia (CC 7, 8)	3.06 (2.56-3.64)	3.04 (2.41-3.84)	3.11 (2.37-4.08)	3.27 (2.09-5.10)
Trauma (CC 154 to 156, 158 to 162)	1.07 (0.93-1.22)	0.94 (0.78-1.12)	1.26 (1.03-1.54)	1.63 (1.12-2.38)
Major Psych Disorders (CC 54 to 56)	1.03 (0.84-1.28)	1.11 (0.85-1.46)	0.93 (0.65-1.32)	1.13 (0.76-1.67)
Liver and Biliary Disease (CC 25 to 27)	1.65 (1.22-2.23)	1.92 (1.31-2.82)	1.31 (0.80-2.15)	2.68 (1.94-3.69)

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

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

Risk Factor	OR (95% CI) for All 65+ (N=44,424, C-statistic=0.690)	OR (95% CI) for FFS 65+ (N=27,977, C-statistic=0.691)	OR (95% CI) for Non-FFS 65+ (N= 16,447, C-statistic=0.694)	OR (95% CI) for All 18-64 (N=15,598, C-Statistic=0.687)
Demographics				
Age	1.05 (1.04-1.05)	1.05 (1.05-1.06)	1.04 (1.04-1.05)	1.02 (1.01-1.03)
Male	1.32 (1.24-1.40)	1.26 (1.17-1.37)	1.39 (1.26-1.53)	1.04 (0.88-1.23)
Cardiovascular				
Percutaneous Transluminal Coronary Angioplasty	0.69 (0.62-0.78)	0.67 (0.58-0.78)	0.74 (0.62-0.90)	0.96 (0.71-1.31)
Coronary Artery Bypass Graft Surgery	0.92 (0.84-1.00)	0.92 (0.82-1.02)	0.93 (0.81-1.06)	0.87 (0.66-1.16)
Congestive Heart failure (CC 80)	1.26 (1.17-1.36)	1.18 (1.07-1.29)	1.43 (1.27-1.61)	1.70 (1.38-2.09)
Acute Myocardial Infarction (CC 81)	1.34 (1.20-1.49)	1.43 (1.25-1.65)	1.16 (0.99-1.38)	1.35 (1.01-1.81)
Unstable Angina (CC 82)	0.80 (0.69-0.93)	0.77 (0.63-0.94)	0.84 (0.66-1.07)	0.84 (0.58-1.22)
Chronic atherosclerosis (CC 83, 84)	1.04 (0.97-1.11)	1.04 (0.95-1.13)	1.05 (0.93-1.18)	1.01 (0.83-1.22)
Cardio-respiratory failure and shock (CC 79)	1.03 (0.93-1.14)	1.03 (0.91-1.17)	1.06 (0.89-1.25)	1.21 (0.96-1.54)
Valvular or Rheumatic Heart Disease (CC 86)	1.15 (1.08-1.23)	1.13 (1.05-1.23)	1.18 (1.06-1.30)	1.38 (1.15-1.66)
Comorbidity				
Hypertension (CC 89, 91)	0.72 (0.67-0.76)	0.73 (0.67-0.79)	0.68 (0.62-0.76)	0.64 (0.54-0.76)
Stroke (CC 95, 96)	1.15 (0.96-1.38)	1.26 (1.01-1.58)	0.96 (0.69-1.32)	1.23 (0.80-1.90)
Renal Failure (CC 131)	1.11 (1.03-1.20)	1.07 (0.97-1.18)	1.16 (1.02-1.31)	1.06 (0.86-1.31)
Chronic Obstructive Pulmonary Disease (CC 108)	1.14 (1.07-1.21)	1.18 (1.09-1.28)	1.11 (1.00-1.23)	1.09 (0.91-1.31)
Pneumonia (CC 111 to 113)	1.33 (1.24-1.42)	1.41 (1.30-1.54)	1.20 (1.08-1.34)	1.01 (0.83-1.22)
Diabetes and DM Complications (CC 15 to 20, 120)	0.90 (0.84-0.96)	0.90 (0.83-0.98)	0.90 (0.81-1.00)	1.03 (0.86-1.24)
Protein-Calorie Malnutrition (CC 21)	1.91 (1.72-2.12)	1.84 (1.62-2.10)	2.03 (1.71-2.40)	1.80 (1.35-2.41)
Dementia and Senility (CC 49, 50)	1.52 (1.42-1.64)	1.47 (1.35-1.62)	1.65 (1.46-1.86)	0.97 (0.59-1.62)
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	0.94 (0.82-1.08)	0.95 (0.80-1.13)	0.92 (0.74-1.16)	1.67 (1.27-2.21)
Vascular or Circulatory Disease (CC 104, 105)	1.05 (0.96-1.15)	1.03 (0.92-1.15)	1.09 (0.94-1.25)	1.17 (0.92-1.49)
Metastatic Cancer and Acute Leukemia (CC 7, 8)	2.79 (2.42-3.21)	2.80 (2.34-3.34)	2.85 (2.26-3.59)	3.96 (2.66-5.90)
Trauma (CC 154 to 156, 158 to 162)	1.30 (1.19-1.43)	1.30 (1.16-1.46)	1.31 (1.12-1.53)	1.12 (0.82-1.53)
Major Psych Disorders (CC 54 to 56)	0.92 (0.78-1.07)	0.99 (0.82-1.19)	0.78 (0.58-1.05)	0.96 (0.72-1.30)
Liver and Biliary Disease (CC 25 to 27)	1.31 (1.09-1.58)	1.24 (0.98-1.58)	1.47 (1.10-1.98)	1.71 (1.35-2.15)

Table 9 c. Odds Ratios for Risk Factors in Pneumonia Mortality Measure -- Stratified Results for FFS Patients 65+, Non-FFS Patients 65+, All Patients 65+, and All Patients 18-64 Years of Age

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

Risk Factor	OR (95% CI) for All 65+ (N=48,401, C-statistic=0.719)	OR (95% CI) for FFS 65+ (N=31,580, C-statistic=0.719)	OR (95% CI) for Non-FFS 65+ (N=16,821, C-statistic=0.724)	OR (95% CI) for All 18-64 (N=20,846, C-statistic=0.788)
Demographics				
Age	1.05 (1.04-1.05)	1.05 (1.04-1.05)	1.05 (1.04-1.05)	1.02 (1.01-1.03)
Male	1.27 (1.20-1.34)	1.26 (1.17-1.35)	1.25 (1.14-1.38)	1.27 (1.10-1.47)
Cardiovascular				
Percutaneous Transluminal Coronary Angioplasty	0.79 (0.68-0.92)	0.78 (0.64-0.94)	0.83 (0.64-1.07)	0.60 (0.36-0.98)
Coronary Artery Bypass Graft Surgery	0.96 (0.86-1.08)	0.93 (0.81-1.07)	1.01 (0.84-1.21)	1.06 (0.69-1.61)
Congestive Heart failure (CC 80)	1.30 (1.20-1.40)	1.34 (1.22-1.47)	1.22 (1.07-1.40)	1.36 (1.09-1.70)
Acute Myocardial Infarction (CC 81)	1.45 (1.25-1.68)	1.39 (1.15-1.68)	1.52 (1.19-1.94)	1.01 (0.62-1.63)
Unstable Angina (CC 82)	0.61 (0.48-0.79)	0.55 (0.40-0.76)	0.71 (0.48-1.05)	0.54 (0.27-1.07)
Chronic atherosclerosis (CC 83, 84)	0.95 (0.88-1.01)	0.95 (0.88-1.04)	0.97 (0.86-1.09)	1.23 (0.98-1.55)
Cardio-respiratory failure and shock (CC 79)	1.11 (1.00-1.23)	1.15 (1.01-1.30)	1.04 (0.86-1.25)	1.11 (0.88-1.39)
Comorbidity				
Hypertension (CC 89, 91)	0.76 (0.72-0.81)	0.77 (0.71-0.83)	0.74 (0.67-0.82)	0.74 (0.64-0.86)
Stroke (CC 95, 96)	1.35 (1.15-1.58)	1.29 (1.07-1.57)	1.45 (1.11-1.91)	1.20 (0.76-1.91)
Cerebrovascular Disease (CC 97 to 99, 103)	0.91 (0.82-1.01)	0.89 (0.79-1.02)	0.96 (0.80-1.15)	0.89 (0.59-1.33)
Renal Failure (CC 131)	1.04 (0.96-1.14)	1.08 (0.97-1.20)	0.95 (0.82-1.10)	0.97 (0.77-1.22)
Chronic Obstructive Pulmonary Disease (CC 108)	0.96 (0.91-1.02)	0.98 (0.91-1.06)	0.95 (0.86-1.05)	0.85 (0.73-0.99)
Pneumonia (CC 111 to 113)	1.08 (1.00-1.16)	1.10 (1.00-1.20)	1.06 (0.93-1.20)	1.12 (0.93-1.35)
Protein-Calorie Malnutrition (CC 21)	2.02 (1.87-2.19)	2.00 (1.82-2.20)	2.11 (1.84-2.42)	2.27 (1.87-2.74)
Dementia and Senility (CC 49, 50)	1.78 (1.67-1.90)	1.69 (1.56-1.83)	1.99 (1.79-2.21)	1.89 (1.40-2.55)
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1.20 (1.07-1.36)	1.20 (1.04-1.38)	1.25 (1.01-1.54)	1.66 (1.32-2.09)
Vascular or Circulatory Disease (CC 104, 105)	1.17 (1.06-1.28)	1.16 (1.03-1.30)	1.20 (1.02-1.41)	1.18 (0.92-1.51)
Metastatic Cancer and Acute Leukemia (CC 7, 8)	4.39 (4.01-4.81)	4.34 (3.87-4.86)	4.53 (3.90-5.27)	8.59 (7.28-10.15)
Trauma (CC 154 to 156, 158 to 162)	1.02 (0.94-1.12)	1.02 (0.91-1.13)	1.05 (0.90-1.22)	0.75 (0.56-0.99)
Major Psych Disorders (CC 54 to 56)	0.87 (0.77-0.99)	0.86 (0.74-1.00)	0.95 (0.76-1.20)	0.86 (0.68-1.09)
Liver and Biliary Disease (CC 25 to 27)	1.49 (1.22-1.80)	1.52 (1.19-1.93)	1.44 (1.03-2.01)	2.04 (1.67-2.49)
Severe hematological disorders (CC 44)	1.31 (1.11-1.55)	1.29 (1.05-1.59)	1.38 (1.04-1.83)	1.51 (1.18-1.93)
Iron deficiency and other/unspecified anemias and blood disease (CC 47)	1.08 (1.02-1.15)	1.08 (1.00-1.16)	1.09 (0.99-1.20)	1.24 (1.06-1.44)
Depression (CC 58)	1.01 (0.93-1.09)	1.02 (0.92-1.12)	1.00 (0.87-1.14)	0.98 (0.81-1.17)
Parkinson's and Huntington's diseases (CC 73)	1.23 (1.08-1.40)	1.19 (1.01-1.39)	1.40 (1.11-1.76)	1.10 (0.55-2.18)
Seizure disorders and convulsions (CC 74)	1.05 (0.93-1.19)	1.04 (0.89-1.22)	1.11 (0.89-1.38)	1.19 (0.94-1.49)

Risk Factor	OR (95% CI) for All 65+ (N=48,401, C-statistic=0.719)	OR (95% CI) for FFS 65+ (N=31,580, C-statistic=0.719)	OR (95% CI) for Non-FFS 65+ (N=16,821, C-statistic=0.724)	OR (95% CI) for All 18-64 (N=20,846, C-statistic=0.788)
Fibrosis of lung and other chronic lung disorders (CC 109)	1.17 (1.06-1.30)	1.12 (0.99-1.28)	1.27 (1.07-1.51)	1.76 (1.37-2.25)
Asthma (CC 110)	0.69 (0.60-0.79)	0.69 (0.58-0.82)	0.67 (0.54-0.84)	0.60 (0.46-0.77)
Vertebral fractures (CC 157)	1.35 (1.16-1.57)	1.32 (1.10-1.59)	1.38 (1.06-1.79)	1.43 (0.83-2.47)

Table 9 d. Odds Ratios for Risk Factors in AMI Readmission Measure -- Stratified Results for FFS Patients 65+, Non-FFS Patients 65+, All Patients 65+, and All Patients 18-64 Years of Age

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

Risk Factor	OR (95% CI) for All 65+ (N=23,029, C-statistic=0.628)	OR (95% CI) for FFS 65+ (N=12,360, C-statistic=0.626)	OR (95% CI) for Non-FFS 65+ (N=10,669, C-statistic=0.633)	OR (95% CI) for All 18-64 (N=15,545, C-statistic=0.688)
Demographics				
Age	1.01 (1.01-1.02)	1.01 (1.00-1.02)	1.02 (1.01-1.03)	1.00 (0.99-1.01)
Male	0.87 (0.81-0.93)	0.83 (0.75-0.91)	0.91 (0.82-1.01)	0.71 (0.63-0.79)
Cardiovascular				
Percutaneous Transluminal Coronary Angioplasty	0.95 (0.85-1.06)	0.89 (0.77-1.04)	1.02 (0.87-1.20)	0.97 (0.82-1.14)
Coronary Artery Bypass Graft Surgery	1.02 (0.91-1.14)	0.98 (0.83-1.14)	1.06 (0.91-1.24)	0.95 (0.76-1.20)
Congestive Heart failure (CC 80)	1.14 (1.02-1.28)	1.13 (0.97-1.32)	1.16 (0.98-1.37)	1.67 (1.36-2.06)
Acute coronary syndrome (CC 81, 82)	1.02 (0.91-1.15)	1.05 (0.89-1.24)	0.96 (0.81-1.15)	1.16 (0.95-1.42)
Anterior Myocardial Infarction (ICD9 410.00-410.19)	1.13 (1.02-1.26)	1.06 (0.91-1.23)	1.24 (1.05-1.46)	1.04 (0.89-1.20)
Other Location of Myocardial Infarction (ICD9 410.20-410.69)	0.85 (0.77-0.95)	0.88 (0.76-1.02)	0.83 (0.70-0.98)	0.93 (0.81-1.06)
Angina pectoris/old myocardial infarction (CC 83)	0.98 (0.89-1.07)	1.01 (0.89-1.15)	0.93 (0.82-1.06)	1.13 (0.97-1.32)
Coronary atherosclerosis/other chronic ischemic heart disease (CC 84)	1.01 (0.92-1.11)	0.99 (0.87-1.12)	1.05 (0.92-1.19)	0.95 (0.82-1.09)
Valvular or Rheumatic Heart Disease (CC 86)	1.14 (1.05-1.24)	1.12 (0.99-1.25)	1.18 (1.04-1.34)	1.29 (1.07-1.54)
Arrhythmias (CC 92, 93)	1.10 (0.99-1.23)	1.08 (0.94-1.25)	1.13 (0.96-1.33)	1.01 (0.80-1.26)
Comorbidity				
Cerebrovascular Disease (CC 97 to 99, 103)	0.96 (0.83-1.11)	1.11 (0.92-1.34)	0.80 (0.64-1.00)	0.90 (0.64-1.26)
Stroke (CC 95, 96)	1.10 (0.87-1.40)	0.98 (0.70-1.37)	1.26 (0.89-1.77)	0.93 (0.57-1.52)
Vascular or Circulatory Disease (CC 104, 105, 106)	1.22 (1.08-1.37)	1.13 (0.97-1.33)	1.35 (1.14-1.61)	1.44 (1.16-1.79)
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1.16 (0.97-1.38)	1.17 (0.92-1.48)	1.17 (0.90-1.52)	1.23 (0.91-1.66)
Diabetes and DM Complications (CC 15 to 20, 119, 120)	1.33 (1.24-1.43)	1.31 (1.18-1.45)	1.36 (1.22-1.52)	1.39 (1.24-1.56)
Renal Failure (CC 131)	1.09 (0.96-1.24)	1.09 (0.91-1.30)	1.07 (0.89-1.29)	1.47 (1.14-1.88)
End-stage renal disease or dialysis (CC 129, 130)	1.47 (1.17-1.85)	1.58 (1.16-2.15)	1.36 (0.97-1.93)	0.79 (0.57-1.09)
Other urinary tract disorders (CC 136)	1.13 (1.03-1.25)	1.11 (0.97-1.26)	1.16 (1.01-1.34)	1.11 (0.91-1.36)
Chronic Obstructive Pulmonary Disease (CC 108)	1.16 (1.07-1.27)	1.19 (1.07-1.33)	1.14 (1.01-1.29)	1.33 (1.15-1.55)
Pneumonia (CC 111 to 113)	1.10 (1.00-1.21)	1.08 (0.95-1.23)	1.13 (0.98-1.31)	1.31 (1.09-1.59)
Asthma (CC 110)	1.17 (0.97-1.39)	1.17 (0.92-1.51)	1.17 (0.90-1.51)	0.99 (0.78-1.26)
Disorders of fluid/electrolyte/acid-base (CC22, 23)	1.09 (0.98-1.22)	1.01 (0.88-1.17)	1.23 (1.04-1.46)	1.26 (1.04-1.52)
History of infection (CC1, 3 to 6)	1.04 (0.90-1.20)	1.06 (0.87-1.27)	1.01 (0.82-1.26)	0.95 (0.75-1.21)
Metastatic Cancer and Acute Leukemia (CC 7)	1.41 (1.08-1.84)	1.39 (0.98-1.96)	1.44 (0.95-2.17)	2.01 (1.15-3.53)
Cancer (CC 8 to 12)	1.14 (0.99-1.30)	1.24 (1.03-1.49)	1.03 (0.83-1.26)	1.30 (0.96-1.78)
Iron deficiency and other/unspecified anemias and blood disease (CC 47)	1.26 (1.17-1.36)	1.27 (1.14-1.41)	1.25 (1.12-1.40)	1.62 (1.42-1.85)

Risk Factor	OR (95% CI) for All 65+ (N=23,029, C-statistic=0.628)	OR (95% CI) for FFS 65+ (N=12,360, C-statistic=0.626)	OR (95% CI) for Non-FFS 65+ (N=10,669, C-statistic=0.633)	OR (95% CI) for All 18-64 (N=15,545, C-statistic=0.688)
Decubitus ulcer or chronic skin ulcer (CC 148, 149)	1.09 (0.90-1.32)	1.02 (0.77-1.34)	1.14 (0.86-1.49)	0.95 (0.68-1.31)
Dementia and Senility (CC 49, 50)	0.98 (0.89-1.09)	1.01 (0.89-1.16)	0.96 (0.82-1.13)	1.03 (0.65-1.63)
Protein-Calorie Malnutrition (CC 21)	1.19 (1.00-1.42)	1.32 (1.06-1.65)	1.04 (0.78-1.37)	1.03 (0.67-1.60)

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

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

Risk Factor	OR (95% CI) for All 65+ (N=54,773, C-statistic=0.617)	OR (95% CI) for FFS 65+ (N=33,784, C-Statistic=0.619)	OR (95% CI) for Non-FFS 65+ (N=20,989, C-Statistic=0.617)	OR (95% CI) for All 18-64 (N=21,763, C-Statistic=0.689)
Demographics				
Age	1.00 (1.00-1.00)	1.00 (1.00-1.00)	1.00 (1.00-1.01)	0.99 (0.99-1.00)
Male	1.03 (0.99-1.08)	1.01 (0.96-1.07)	1.07 (1.00-1.15)	1.02 (0.95-1.10)
Cardiovascular				
Coronary Artery Bypass Graft Surgery	0.98 (0.93-1.03)	0.96 (0.89-1.02)	1.01 (0.92-1.10)	0.94 (0.84-1.05)
Congestive Heart failure (CC 80)	1.18 (1.11-1.24)	1.19 (1.11-1.28)	1.16 (1.06-1.27)	1.31 (1.21-1.43)
Acute coronary syndrome (CC 81, 82)	1.03 (0.97-1.10)	0.99 (0.91-1.07)	1.11 (1.00-1.22)	1.09 (0.99-1.21)
Arrhythmias (CC 92, 93)	1.05 (1.00-1.11)	1.05 (0.98-1.12)	1.06 (0.98-1.15)	1.24 (1.14-1.35)
Cardio-respiratory failure and shock (CC 79)	1.08 (1.01-1.16)	1.04 (0.95-1.13)	1.17 (1.04-1.30)	1.13 (1.02-1.25)
Valvular or Rheumatic Heart Disease (CC 86)	1.09 (1.04-1.13)	1.08 (1.02-1.14)	1.09 (1.01-1.17)	1.06 (0.98-1.15)
Vascular or Circulatory Disease (CC 104, 105, 106)	1.02 (0.97-1.08)	1.04 (0.97-1.11)	1.00 (0.91-1.09)	1.18 (1.08-1.29)
Chronic atherosclerosis (CC 83, 84)	1.11 (1.06-1.17)	1.15 (1.08-1.22)	1.04 (0.96-1.13)	1.21 (1.12-1.31)
Other and unspecified heart disease (CC 94)	1.02 (0.95-1.11)	1.02 (0.93-1.13)	1.02 (0.90-1.16)	1.02 (0.91-1.14)
Comorbidity				
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1.13 (1.03-1.23)	1.16 (1.05-1.30)	1.06 (0.91-1.22)	0.95 (0.84-1.09)
Stroke (CC 95, 96)	1.04 (0.92-1.18)	1.00 (0.85-1.17)	1.13 (0.92-1.40)	1.04 (0.85-1.29)
Renal Failure (CC 131)	1.16 (1.10-1.23)	1.17 (1.09-1.25)	1.14 (1.04-1.25)	1.09 (0.99-1.20)
Chronic Obstructive Pulmonary Disease (CC 108)	1.12 (1.07-1.17)	1.11 (1.05-1.18)	1.12 (1.04-1.20)	1.19 (1.11-1.29)
Diabetes and DM Complications (CC 15 to 20, 119, 120)	1.16 (1.11-1.21)	1.13 (1.07-1.19)	1.20 (1.11-1.29)	1.07 (0.99-1.15)
Disorders of fluid/electrolyte/acid-base (CC22, 23)	1.16 (1.10-1.22)	1.14 (1.07-1.22)	1.17 (1.07-1.27)	1.30 (1.19-1.41)
Other urinary tract disorders (CC 136)	1.17 (1.11-1.22)	1.18 (1.11-1.26)	1.14 (1.05-1.24)	1.10 (1.01-1.19)
Decubitus ulcer or chronic skin ulcer (CC 148, 149)	1.17 (1.08-1.26)	1.18 (1.07-1.31)	1.14 (1.00-1.30)	1.02 (0.90-1.15)
Other gastrointestinal disorders (CC 36)	1.06 (1.02-1.11)	1.07 (1.01-1.13)	1.05 (0.97-1.13)	1.21 (1.13-1.31)
Peptic ulcer, hemorrhage, other specified gastrointestinal disorders (CC 34)	1.02 (0.95-1.09)	1.11 (1.01-1.20)	0.88 (0.78-0.99)	1.08 (0.96-1.22)
Severe hematological disorders (CC 44)	1.25 (1.09-1.44)	1.16 (0.98-1.39)	1.44 (1.13-1.83)	1.17 (0.93-1.48)
Nephritis (CC132)	1.00 (0.91-1.09)	0.98 (0.88-1.11)	1.03 (0.91-1.18)	0.97 (0.86-1.09)
Dementia and Senility (CC 49, 50)	1.00 (0.94-1.06)	1.00 (0.93-1.07)	0.99 (0.90-1.10)	0.78 (0.61-0.99)
Metastatic Cancer and Acute Leukemia (CC 7)	1.15 (0.98-1.36)	1.22 (1.00-1.50)	1.03 (0.78-1.37)	1.31 (0.93-1.84)
Cancer (CC 8 to 12)	1.05 (0.98-1.13)	1.00 (0.91-1.09)	1.16 (1.03-1.30)	0.95 (0.81-1.10)
Liver and biliary disease (CC 25 to 30)	1.12 (1.03-1.21)	1.07 (0.97-1.19)	1.20 (1.06-1.37)	1.22 (1.12-1.33)
End-stage renal disease or dialysis (CC 129, 130)	1.40 (1.27-1.54)	1.45 (1.28-1.63)	1.32 (1.11-1.56)	1.27 (1.12-1.44)
Asthma (CC 110)	0.98 (0.90-1.07)	0.97 (0.87-1.08)	1.00 (0.86-1.16)	1.07 (0.97-1.18)

Risk Factor	OR (95% CI) for All 65+ (N=54,773, C-statistic=0.617)	OR (95% CI) for FFS 65+ (N=33,784, C-Statistic=0.619)	OR (95% CI) for Non-FFS 65+ (N=20,989, C-Statistic=0.617)	OR (95% CI) for All 18-64 (N=21,763, C-Statistic=0.689)
Iron deficiency and other/unspecified anemias and blood disease (CC 47)	1.15 (1.09-1.20)	1.12 (1.06-1.19)	1.18 (1.10-1.28)	1.28 (1.19-1.38)
Pneumonia (CC 111 to 113)	1.06 (1.01-1.11)	1.05 (0.99-1.12)	1.07 (0.98-1.15)	1.07 (0.99-1.15)
Drug/alcohol abuse/dependence/psychosis (CC 51 to 53)	1.05 (0.99-1.13)	1.06 (0.97-1.15)	1.05 (0.94-1.17)	1.13 (1.05-1.22)
Major pysch disorders (CC 54 to 56)	1.09 (0.98-1.21)	1.13 (0.99-1.28)	1.00 (0.83-1.21)	1.48 (1.32-1.65)
Depression (CC 58)	1.03 (0.97-1.10)	1.06 (0.98-1.15)	1.00 (0.90-1.10)	1.08 (0.98-1.18)
Other psychiatric disorders (CC 60)	1.14 (1.06-1.24)	1.11 (1.00-1.23)	1.19 (1.05-1.36)	1.21 (1.08-1.35)
Fibrosis of lung and other chronic lung disorders (CC 109)	1.14 (1.03-1.25)	1.11 (0.99-1.25)	1.18 (1.01-1.37)	1.16 (0.95-1.40)
Protein-Calorie Malnutrition (CC 21)	1.02 (0.93-1.12)	1.04 (0.93-1.16)	0.98 (0.84-1.15)	1.14 (0.98-1.33)

Table 9 f. Odds Ratios for Risk Factors in Pneumonia Readmission Measure - Stratified Results for FFS Patients 65+, Non-FFS Patients 65+, All Patients 65+, and All Patients 18-64 Years of Age

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

Risk Factor	OR (95% CI) for All 65+ (N=51,131, C-Statistic=0.638)	OR (95% CI) for FFS 65+ (N=32,778, C-Statistic=0.642)	OR (95% CI) for Non-FFS 65+ (N=18,353, C-Statistic=0.634)	OR (95% CI) for All 18-64 (N=23,440, C-Statistic=0.722)
Demographics				
Age	1.00 (1.00-1.00)	1.00 (0.99-1.00)	1.01 (1.00-1.01)	1.00 (1.00-1.00)
Male	1.08 (1.02-1.13)	1.05 (0.99-1.12)	1.13 (1.04-1.22)	1.15 (1.06-1.24)
Comorbidity				
Coronary Artery Bypass Graft Surgery	0.85 (0.77-0.93)	0.83 (0.74-0.92)	0.90 (0.77-1.04)	0.73 (0.58-0.93)
History of infection (CC 1, 3 to 6)	1.12 (1.03-1.21)	1.07 (0.98-1.18)	1.21 (1.06-1.39)	1.28 (1.15-1.43)
Septicemia/shock (CC 2)	1.01 (0.91-1.11)	1.01 (0.90-1.14)	1.01 (0.84-1.22)	0.90 (0.77-1.04)
Metastatic Cancer and Acute Leukemia (CC 7)	1.37 (1.20-1.57)	1.36 (1.15-1.60)	1.41 (1.13-1.76)	1.82 (1.51-2.20)
Lung cancer (CC 8)	1.35 (1.19-1.53)	1.39 (1.19-1.63)	1.27 (1.02-1.57)	1.67 (1.36-2.05)
Lymphatic, head and neck, brain, and other major cancers; breast, prostate, colorectal and other cancers and tumors (CC 9, 10)	1.08 (0.99-1.18)	1.12 (1.00-1.25)	1.02 (0.88-1.19)	1.52 (1.30-1.76)
Diabetes and DM Complications (CC 15 to 20, 119, 120)	1.14 (1.08-1.20)	1.12 (1.05-1.20)	1.18 (1.08-1.29)	1.07 (0.98-1.17)
Protein-Calorie Malnutrition (CC 21)	1.22 (1.13-1.33)	1.26 (1.15-1.38)	1.15 (1.00-1.33)	1.21 (1.06-1.39)
Disorders of fluid/electrolyte/acid-base (CC22, 23)	1.12 (1.05-1.19)	1.14 (1.06-1.23)	1.07 (0.96-1.19)	1.24 (1.12-1.37)
Other gastrointestinal disorders (CC 36)	1.12 (1.06-1.18)	1.11 (1.04-1.18)	1.14 (1.05-1.24)	1.20 (1.11-1.31)
Severe hematological disorders (CC 44)	1.35 (1.17-1.57)	1.29 (1.08-1.55)	1.50 (1.16-1.92)	1.67 (1.41-1.96)
Iron deficiency and other/unspecified anemias and blood disease (CC 47)	1.17 (1.11-1.23)	1.17 (1.09-1.24)	1.17 (1.07-1.27)	1.19 (1.09-1.30)
Dementia and Senility (CC 49, 50)	1.09 (1.03-1.16)	1.13 (1.05-1.21)	1.01 (0.91-1.12)	1.20 (0.99-1.45)
Drug/alcohol abuse/dependence/psychosis (CC 51 to 53)	1.02 (0.95-1.10)	0.96 (0.88-1.05)	1.15 (1.02-1.29)	1.01 (0.93-1.10)
Major pysch disorders (CC 54 to 56)	1.16 (1.06-1.28)	1.16 (1.04-1.30)	1.15 (0.96-1.39)	1.37 (1.22-1.53)
Other psychiatric disorders (CC 60)	1.09 (0.99-1.19)	1.02 (0.91-1.14)	1.22 (1.06-1.42)	1.30 (1.16-1.46)
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	1.12 (1.01-1.23)	1.06 (0.95-1.20)	1.25 (1.04-1.49)	1.14 (0.99-1.31)
Cardio-respiratory failure and shock (CC 79)	1.14 (1.05-1.24)	1.11 (1.00-1.23)	1.19 (1.03-1.39)	1.00 (0.89-1.14)
Congestive Heart failure (CC 80)	1.18 (1.11-1.27)	1.18 (1.08-1.28)	1.19 (1.06-1.35)	1.23 (1.09-1.39)
Acute coronary syndrome (CC 81, 82)	1.06 (0.95-1.18)	1.11 (0.98-1.27)	0.95 (0.79-1.14)	1.32 (1.08-1.62)
Chronic atherosclerosis (CC 83, 84)	1.13 (1.07-1.19)	1.12 (1.05-1.20)	1.14 (1.04-1.26)	1.16 (1.03-1.31)
Valvular or Rheumatic Heart Disease (CC 86)	1.13 (1.05-1.22)	1.13 (1.04-1.24)	1.13 (1.00-1.28)	1.07 (0.91-1.26)
Arrhythmias (CC 92, 93)	1.05 (0.98-1.12)	1.05 (0.97-1.13)	1.04 (0.93-1.17)	1.05 (0.92-1.19)
Stroke (CC 95, 96)	0.95 (0.82-1.09)	1.04 (0.88-1.23)	0.75 (0.58-0.99)	1.07 (0.80-1.42)
Vascular or Circulatory Disease (CC 104, 105, 106)	1.01 (0.94-1.08)	0.99 (0.91-1.08)	1.04 (0.92-1.18)	1.13 (1.01-1.28)
Chronic Obstructive Pulmonary Disease (CC 108)	1.24 (1.18-1.31)	1.26 (1.18-1.34)	1.21 (1.11-1.31)	1.25 (1.14-1.36)
Fibrosis of lung and other chronic lung disorders (CC 109)	1.19 (1.09-1.30)	1.22 (1.10-1.35)	1.13 (0.97-1.31)	1.33 (1.15-1.53)
Asthma (CC 110)	0.96 (0.87-1.06)	0.97 (0.86-1.10)	0.95 (0.81-1.12)	0.93 (0.84-1.04)

Pneumonia (CC 111 to 113)	1.12 (1.06-1.20)	1.12 (1.04-1.22)	1.13 (1.01-1.26)	1.35 (1.22-1.49)
Pleural effusion/pneumothorax (CC 114)	0.98 (0.86-1.10)	1.00 (0.86-1.16)	0.92 (0.74-1.15)	1.17 (0.98-1.40)
Other lung disorders (CC 115)	1.00 (0.93-1.07)	1.00 (0.92-1.08)	1.00 (0.88-1.12)	1.16 (1.05-1.28)
End-stage renal disease or dialysis (CC 129, 130)	1.38 (1.18-1.61)	1.33 (1.10-1.62)	1.47 (1.13-1.90)	1.41 (1.16-1.73)
Renal Failure (CC 131)	1.16 (1.08-1.26)	1.21 (1.10-1.33)	1.08 (0.94-1.23)	1.21 (1.05-1.39)
Urinary tract infection (CC 135)	1.12 (1.04-1.21)	1.10 (1.00-1.21)	1.16 (1.00-1.33)	1.14 (1.00-1.31)
Other urinary tract disorders (CC 136)	1.06 (0.99-1.13)	1.06 (0.98-1.15)	1.06 (0.95-1.18)	1.18 (1.04-1.33)
Decubitus ulcer or chronic skin ulcer (CC 148, 149)	1.09 (0.99-1.20)	1.13 (1.00-1.27)	1.00 (0.83-1.20)	1.16 (0.98-1.36)
Vertebral fractures (CC 157)	1.25 (1.09-1.42)	1.25 (1.06-1.47)	1.25 (0.99-1.59)	1.32 (0.96-1.83)
Other injuries (CC 162)	1.10 (1.01-1.21)	1.08 (0.97-1.21)	1.15 (0.98-1.34)	1.27 (1.09-1.49)

Table 10 a. AMI Mortality Model with Interaction Terms – Logistic Regression Model (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

Risk Factor	Estimate	Standard Error	Wald Chi-Square	P-value	OR	LOR	UOR
Older (Age>=65)	0.105	0.143	0.543	0.4611	1.11	0.84	1.47
Interactions							
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 10 b. HF Mortality Model with Interaction Terms – Logistic Regression Model (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	-5.956	0.152	1534.459	0.0000			
Demographics							
Age	0.044	0.002	480.427	0.0000	1.04	1.04	1.05
Male	0.060	0.087	0.479	0.4888	1.06	0.90	1.26
Cardiovascular							
Percutaneous Transluminal Coronary Angioplasty	-0.049	0.157	0.097	0.7554	0.95	0.70	1.29
Coronary Artery Bypass Graft Surgery	-0.193	0.145	1.785	0.1816	0.82	0.62	1.09
Congestive Heart failure (CC 80)	0.566	0.106	28.379	0.0000	1.76	1.43	2.17
Acute Myocardial Infarction (CC 81)	0.300	0.150	3.998	0.0456	1.35	1.01	1.81
Unstable Angina (CC 82)	-0.161	0.190	0.719	0.3965	0.85	0.59	1.24
Chronic atherosclerosis (CC 83, 84)	-0.073	0.099	0.547	0.4594	0.93	0.77	1.13
Cardio-respiratory failure and shock (CC 79)	0.207	0.122	2.863	0.0907	1.23	0.97	1.56
Valvular or Rheumatic Heart Disease (CC 86)	0.331	0.094	12.505	0.0004	1.39	1.16	1.67
Comorbidity							
Hypertension (CC 89, 91)	-0.450	0.088	26.112	0.0000	0.64	0.54	0.76
Stroke (CC 95, 96)	0.235	0.223	1.120	0.2900	1.27	0.82	1.96
Renal Failure (CC 131)	0.050	0.106	0.225	0.6353	1.05	0.85	1.30
Chronic Obstructive Pulmonary Disease (CC 108)	0.032	0.092	0.121	0.7275	1.03	0.86	1.24
Pneumonia (CC 111 to 113)	0.012	0.099	0.015	0.9023	1.01	0.83	1.23
Diabetes and DM Complications (CC 15 to 20, 120)	-0.030	0.092	0.108	0.7428	0.97	0.81	1.16
Protein-Calorie Malnutrition (CC 21)	0.576	0.148	15.189	0.0001	1.78	1.33	2.38
Dementia and Senility (CC 49, 50)	-0.075	0.260	0.084	0.7720	0.93	0.56	1.54
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	0.512	0.141	13.129	0.0003	1.67	1.26	2.20
Vascular or Circulatory Disease (CC 104, 105)	0.162	0.122	1.773	0.1830	1.18	0.93	1.49
Metastatic Cancer and Acute Leukemia (CC 7, 8)	1.316	0.203	41.862	0.0000	3.73	2.50	5.56
Trauma (CC 154 to 156, 158 to 162)	0.105	0.159	0.433	0.5104	1.11	0.81	1.52
Major Psych Disorders (CC 54 to 56)	-0.005	0.153	0.001	0.9722	0.99	0.74	1.34
Liver and Biliary Disease (CC 25 to 27)	0.544	0.119	21.049	0.0000	1.72	1.37	2.17

Risk Factor	Estimate	Standard Error	Wald Chi-Square	P-value	OR	LOR	UOR
Older (Age>=65)	-0.030	0.132	0.051	0.8208	0.97	0.75	1.26
Interactions							
Older and Male	0.209	0.092	5.123	0.0236	1.23	1.03	1.48
Cardiovascular							
Older and Percutaneous Transluminal Coronary Angioplasty	-0.322	0.168	3.680	0.0551	0.72	0.52	1.01
Older and Coronary Artery Bypass Graft Surgery	0.103	0.151	0.465	0.4955	1.11	0.82	1.49
Older and Congestive Heart failure (CC 80)	-0.332	0.113	8.645	0.0033	0.72	0.58	0.90
Older and Acute Myocardial Infarction (CC 81)	-0.008	0.160	0.002	0.9615	0.99	0.73	1.36
Older and Unstable Angina (CC82)	-0.063	0.206	0.093	0.7599	0.94	0.63	1.41
Older and Chronic atherosclerosis (CC 83, 84)	0.109	0.106	1.073	0.3002	1.12	0.91	1.37
Older and Cardio-respiratory failure and shock (CC 79)	-0.180	0.133	1.840	0.1750	0.84	0.64	1.08
Older and Valvular or Rheumatic Heart Disease (CC 86)	-0.187	0.099	3.571	0.0588	0.83	0.68	1.01
Comorbidity							
Older and Hypertension (CC 89, 91)	0.116	0.094	1.538	0.2149	1.12	0.93	1.35
Older and Stroke (CC 95, 96)	-0.094	0.241	0.151	0.6977	0.91	0.57	1.46
Older and Renal Failure (CC 131)	0.056	0.114	0.242	0.6230	1.06	0.85	1.32
Older and Chronic Obstructive Pulmonary Disease (CC 108)	0.095	0.097	0.953	0.3289	1.10	0.91	1.33
Older and 'Pneumonia (CC 111 to 113)	0.276	0.105	6.896	0.0086	1.32	1.07	1.62
Older and Diabetes and DM Complications (CC 15 to 20, 120)	-0.093	0.098	0.902	0.3423	0.91	0.75	1.10
Older and Protein-Calorie Malnutrition (CC 21)	0.071	0.157	0.203	0.6525	1.07	0.79	1.46
Older and Dementia and Senility (CC 49, 50)	0.511	0.262	3.796	0.0514	1.67	1.00	2.79
Older and Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	-0.581	0.157	13.617	0.0002	0.56	0.41	0.76
Older and Vascular or Circulatory Disease (CC 104, 105)	-0.116	0.130	0.794	0.3728	0.89	0.69	1.15
Older and 'Metastatic Cancer and Acute Leukemia (CC 7, 8)	-0.299	0.216	1.916	0.1663	0.74	0.49	1.13
Older and Trauma (CC 154 to 156, 158 to 162)	0.163	0.166	0.960	0.3273	1.18	0.85	1.63
Older and Major Psych Disorders (CC 54 to 56)	-0.092	0.173	0.287	0.5922	0.91	0.65	1.28
Older and Liver and Biliary Disease (CC 25 to 27)	-0.287	0.152	3.581	0.0584	0.75	0.56	1.01

Table 10 c. Pneumonia Mortality Model with Interaction Terms -- Logistic Regression Model (N=69,247, C-Statistic=0.759)

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	-5.863	0.120	2370.870	0.0000			
Demographics							
Age	0.041	0.002	547.044	0.0000	1.04	1.04	1.05
Male	0.241	0.073	10.790	0.0010	1.27	1.10	1.47
Cardiovascular							
Percutaneous Transluminal Coronary Angioplasty	-0.528	0.254	4.315	0.0378	0.59	0.36	0.97
Coronary Artery Bypass Graft Surgery	0.020	0.214	0.009	0.9247	1.02	0.67	1.55
Congestive Heart failure (CC 80)	0.310	0.114	7.376	0.0066	1.36	1.09	1.70
Acute Myocardial Infarction (CC 81)	-0.006	0.245	0.001	0.9809	0.99	0.62	1.61
Unstable Angina (CC 82)	-0.609	0.346	3.093	0.0786	0.54	0.28	1.07
Chronic atherosclerosis (CC 83, 84)	0.159	0.115	1.934	0.1643	1.17	0.94	1.47
Cardio-respiratory failure and shock (CC 79)	0.115	0.116	0.988	0.3203	1.12	0.89	1.41
Comorbidity							
Hypertension (CC 89, 91)	-0.360	0.075	22.995	0.0000	0.70	0.60	0.81
Stroke (CC 95, 96)	0.191	0.238	0.646	0.4215	1.21	0.76	1.93
Cerebrovascular Disease (CC 97 to 99, 103)	-0.158	0.206	0.590	0.4423	0.85	0.57	1.28
Renal Failure (CC 131)	-0.051	0.118	0.190	0.6631	0.95	0.75	1.20
Chronic Obstructive Pulmonary Disease (CC 108)	-0.239	0.078	9.410	0.0022	0.79	0.68	0.92
Pneumonia (CC 111 to 113)	0.135	0.094	2.074	0.1499	1.14	0.95	1.38
Protein-Calorie Malnutrition (CC 21)	0.823	0.097	71.800	0.0000	2.28	1.88	2.75
Dementia and Senility (CC 49, 50)	0.592	0.153	14.905	0.0001	1.81	1.34	2.44
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	0.531	0.119	19.894	0.0000	1.70	1.35	2.15
Vascular or Circulatory Disease (CC 104, 105)	0.151	0.126	1.428	0.2321	1.16	0.91	1.49
Metastatic Cancer and Acute Leukemia (CC 7, 8)	2.106	0.084	621.583	0.0000	8.22	6.96	9.70
Trauma (CC 154 to 156, 158 to 162)	-0.290	0.146	3.937	0.0472	0.75	0.56	1.00
Major Psych Disorders (CC 54 to 56)	-0.142	0.121	1.384	0.2395	0.87	0.69	1.10
Liver and Biliary Disease (CC 25 to 27)	0.706	0.102	48.290	0.0000	2.03	1.66	2.47
Severe hematological disorders (CC 44)	0.434	0.127	11.666	0.0006	1.54	1.20	1.98
Iron deficiency and other/unspecified anemias and blood disease (CC 47)	0.213	0.077	7.602	0.0058	1.24	1.06	1.44

Risk Factor	Estimate	Standard Error	Wald Chi-Square	P-value	OR	LOR	UOR
Depression (CC 58)	-0.022	0.094	0.054	0.8156	0.98	0.81	1.18
Parkinson's and Huntington's diseases (CC 73)	0.034	0.350	0.010	0.9215	1.04	0.52	2.05
Seizure disorders and convulsions (CC 74)	0.212	0.118	3.234	0.0721	1.24	0.98	1.56
Fibrosis of lung and other chronic lung disorders (CC 109)	0.559	0.126	19.758	0.0000	1.75	1.37	2.24
Asthma (CC 110)	-0.468	0.130	13.044	0.0003	0.63	0.49	0.81
Vertebral fractures (CC 157)	0.361	0.279	1.671	0.1962	1.43	0.83	2.48
Older (Age>=65)	0.151	0.104	2.110	0.1463	1.16	0.95	1.43
Interactions							
Older and Male	-0.011	0.079	0.019	0.8903	0.99	0.85	1.15
Cardiovascular							
Older and Percutaneous Transluminal Coronary Angioplasty	0.285	0.266	1.155	0.2825	1.33	0.79	2.24
Older and Coronary Artery Bypass Graft Surgery	-0.064	0.222	0.082	0.7745	0.94	0.61	1.45
Older and Congestive Heart failure (CC 80)	-0.046	0.121	0.144	0.7046	0.96	0.75	1.21
Older and Acute Myocardial Infarction (CC 81)	0.376	0.257	2.144	0.1431	1.46	0.88	2.41
Older and Unstable Angina (CC82)	0.119	0.369	0.104	0.7465	1.13	0.55	2.32
Older and Chronic atherosclerosis (CC 83, 84)	-0.210	0.120	3.094	0.0786	0.81	0.64	1.02
Older and Cardio-respiratory failure and shock (CC 79)	-0.020	0.127	0.026	0.8726	0.98	0.76	1.26
Comorbidity							
Older and Hypertension (CC 89, 91)	0.090	0.081	1.241	0.2654	1.09	0.93	1.28
Older and Stroke (CC 95, 96)	0.110	0.251	0.192	0.6614	1.12	0.68	1.82
Older and Cerebrovascular Disease (CC 97 to 99, 103)	0.062	0.213	0.084	0.7721	1.06	0.70	1.61
Older and Renal Failure (CC 131)	0.090	0.126	0.516	0.4727	1.09	0.86	1.40
Older and Chronic Obstructive Pulmonary Disease (CC 108)	0.193	0.084	5.315	0.0211	1.21	1.03	1.43
Older and Pneumonia (CC 111 to 113)	-0.062	0.101	0.373	0.5416	0.94	0.77	1.15
Older and Protein-Calorie Malnutrition (CC 21)	-0.118	0.105	1.257	0.2621	0.89	0.72	1.09
Older and Dementia and Senility (CC 49, 50)	0.005	0.157	0.001	0.9759	1.00	0.74	1.37
Older and Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	-0.355	0.133	7.078	0.0078	0.70	0.54	0.91
Older and Vascular or Circulatory Disease (CC 104, 105)	0.003	0.135	0.000	0.9830	1.00	0.77	1.31
Older and Metastatic Cancer and Acute Leukemia (CC 7, 8)	-0.642	0.096	44.234	0.0000	0.53	0.44	0.64
Older and Trauma (CC 154 to 156, 158 to 162)	0.318	0.153	4.311	0.0379	1.37	1.02	1.86

Risk Factor	Estimate	Standard Error	Wald Chi-Square	P-value	OR	LOR	UOR
Older and Major Psych Disorders (CC 54 to 56)	-0.006	0.136	0.002	0.9676	0.99	0.76	1.30
Older and Liver and Biliary Disease (CC 25 to 27)	-0.331	0.142	5.429	0.0198	0.72	0.54	0.95
Older and Severe hematological disorders (CC 44)	-0.167	0.153	1.197	0.2739	0.85	0.63	1.14
Older and Iron deficiency and other/unspecified anemias and blood disease (CC 47)	-0.135	0.083	2.655	0.1032	0.87	0.74	1.03
Older and Depression (CC 58)	0.023	0.102	0.053	0.8182	1.02	0.84	1.25
Older and Parkinson's and Huntington's diseases (CC 73)	0.170	0.356	0.227	0.6336	1.18	0.59	2.38
Older and Seizure disorders and convulsions (CC 74)	-0.173	0.134	1.658	0.1978	0.84	0.65	1.09
Older and Fibrosis of lung and other chronic lung disorders (CC 109)	-0.403	0.136	8.747	0.0031	0.67	0.51	0.87
Older and Asthma (CC 110)	0.086	0.147	0.343	0.5580	1.09	0.82	1.45
Older and Vertebral fractures (CC 157)	-0.059	0.290	0.042	0.8373	0.94	0.53	1.66

Table 10 d. AMI Readmission Model with Interaction Terms -- Logistic Regression Model (N=38,574 C-Statistic=0.672)

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	-2.777	0.133	435.247	0.0000			
Demographics							
Age	0.009	0.002	21.251	0.0000	1.01	1.01	1.01
Male	-0.338	0.058	33.484	0.0000	0.71	0.64	0.80
Cardiovascular							
Percutaneous Transluminal Coronary Angioplasty	-0.038	0.083	0.211	0.6460	0.96	0.82	1.13
Coronary Artery Bypass Graft Surgery	-0.066	0.115	0.332	0.5642	0.94	0.75	1.17
Congestive Heart failure (CC 80)	0.521	0.105	24.490	0.0000	1.68	1.37	2.07
Acute coronary syndrome (CC 81, 82)	0.159	0.101	2.495	0.1142	1.17	0.96	1.43
Anterior Myocardial Infarction (ICD9 410.00-410.19)	0.045	0.076	0.342	0.5586	1.05	0.90	1.21
Other Location of Myocardial Infarction (ICD9 410.20-410.69)	-0.071	0.069	1.075	0.2998	0.93	0.81	1.07
Angina pectoris/Older myocardial infarction (CC 83)	0.122	0.079	2.386	0.1224	1.13	0.97	1.32
Coronary atherosclerosis/other chronic ischemic heart disease (CC 84)	-0.071	0.071	1.012	0.3145	0.93	0.81	1.07
Valvular or Rheumatic Heart Disease (CC 86)	0.244	0.092	6.994	0.0082	1.28	1.07	1.53
Arrhythmias (CC 92, 93)	-0.002	0.117	0.000	0.9842	1.00	0.79	1.25
Comorbidity							
Cerebrovascular Disease (CC 97 to 99, 103)	-0.124	0.173	0.516	0.4726	0.88	0.63	1.24
Stroke (CC 95, 96)	-0.071	0.251	0.080	0.7776	0.93	0.57	1.52
Vascular or Circulatory Disease (CC 104, 105, 106)	0.358	0.112	10.236	0.0014	1.43	1.15	1.78
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	0.204	0.154	1.762	0.1844	1.23	0.91	1.66
Diabetes and DM Complications (CC 15 to 20, 119, 120)	0.316	0.058	29.499	0.0000	1.37	1.22	1.54
Renal Failure (CC 131)	0.385	0.128	9.060	0.0026	1.47	1.14	1.89
End-stage renal disease or dialysis (CC 129, 130)	-0.231	0.164	1.985	0.1589	0.79	0.58	1.09
Other urinary tract disorders (CC 136)	0.106	0.102	1.089	0.2968	1.11	0.91	1.36
Chronic Obstructive Pulmonary Disease (CC 108)	0.263	0.075	12.282	0.0005	1.30	1.12	1.51
Pneumonia (CC 111 to 113)	0.265	0.096	7.563	0.0060	1.30	1.08	1.57
Asthma (CC 110)	0.004	0.123	0.001	0.9765	1.00	0.79	1.28
Disorders of fluid/electrolyte/acid-base (CC 22, 23)	0.236	0.098	5.773	0.0163	1.27	1.04	1.53
History of infection (CC1, 3 to 6)	-0.040	0.124	0.103	0.7477	0.96	0.75	1.23

Risk Factor	Estimate	Standard Error	Wald Chi-Square	P-value	OR	LOR	UOR
Metastatic Cancer and Acute Leukemia (CC 7)	0.676	0.286	5.602	0.0179	1.97	1.12	3.44
Cancer (CC 8 to 12)	0.247	0.158	2.461	0.1167	1.28	0.94	1.74
Iron deficiency and other/unspecified anemias and blood disease (CC 47)	0.476	0.068	48.667	0.0000	1.61	1.41	1.84
Decubitus ulcer or chronic skin ulcer (CC 148, 149)	-0.055	0.168	0.108	0.7426	0.95	0.68	1.31
Dementia and Senility (CC 49, 50)	0.015	0.235	0.004	0.9476	1.02	0.64	1.61
Protein-Calorie Malnutrition (CC 21)	0.034	0.222	0.024	0.8773	1.03	0.67	1.60
Older (Age>=65)	0.175	0.111	2.486	0.1149	1.19	0.96	1.48
Interactions							
Older and Male	0.187	0.069	7.391	0.0066	1.21	1.05	1.38
Cardiovascular							
Oldererer and Percutaneous Transluminal Coronary Angioplasty	-0.017	0.100	0.028	0.8660	0.98	0.81	1.20
Older and Coronary Artery Bypass Graft Surgery	0.087	0.128	0.463	0.4963	1.09	0.85	1.40
Older and Congestive Heart failure (CC 80)	-0.383	0.120	10.170	0.0014	0.68	0.54	0.86
Older and Acute coronary syndrome (CC 81, 82)	-0.139	0.118	1.396	0.2374	0.87	0.69	1.10
Older and Anterior Myocardial Infarction (ICD9 410.00-410.19)	0.075	0.094	0.639	0.4240	1.08	0.90	1.30
Older and Other Location of Myocardial Infarction (ICD9 410.20-410.69)	-0.093	0.088	1.109	0.2923	0.91	0.77	1.08
Older and Angina pectoris/Older myocardial infarction (CC 83)	-0.145	0.092	2.481	0.1152	0.87	0.72	1.04
Older and Coronary atherosclerosis/other chronic ischemic heart disease (CC 84)	0.074	0.085	0.760	0.3832	1.08	0.91	1.27
Older and Valvular or Rheumatic Heart Disease (CC 86)	-0.105	0.102	1.052	0.3051	0.90	0.74	1.10
Older and Arrhythmias (CC 92, 93)	0.104	0.129	0.653	0.4189	1.11	0.86	1.43
Comorbidity							
Older and Cerebrovascular Disease (CC 97 to 99, 103)	0.080	0.188	0.183	0.6687	1.08	0.75	1.57
Older and Stroke (CC 95, 96)	0.167	0.278	0.362	0.5475	1.18	0.69	2.04
Older and Vascular or Circulatory Disease (CC 104, 105, 106)	-0.163	0.127	1.652	0.1987	0.85	0.66	1.09
Older and Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	-0.066	0.178	0.135	0.7133	0.94	0.66	1.33
Older and Diabetes and DM Complications (CC 15 to 20, 119, 120)	-0.042	0.069	0.367	0.5445	0.96	0.84	1.10
Older and Renal Failure (CC 131)	-0.298	0.144	4.304	0.0380	0.74	0.56	0.98
Older and End-stage renal disease or dialysis (CC 129, 130)	0.605	0.201	9.034	0.0026	1.83	1.23	2.72
Older and Other urinary tract disorders (CC 136)	0.024	0.113	0.045	0.8311	1.02	0.82	1.28
Older and Chronic Obstructive Pulmonary Disease (CC 108)	-0.115	0.086	1.773	0.1830	0.89	0.75	1.06
Older and Pneumonia (CC 111 to 113)	-0.164	0.108	2.312	0.1284	0.85	0.69	1.05

Risk Factor	Estimate	Standard Error	Wald Chi-Square	P-value	OR	LOR	UOR
Older and Asthma (CC 110)	0.145	0.153	0.889	0.3458	1.16	0.86	1.56
Older and Disorders of fluid/electrolyte/acid-base (CC 22, 23)	-0.147	0.113	1.703	0.1919	0.86	0.69	1.08
Older and History of infection (CC1, 3 to 6)	0.076	0.144	0.277	0.5988	1.08	0.81	1.43
Older and Metastatic Cancer and Acute Leukemia (CC 7)	-0.338	0.316	1.144	0.2848	0.71	0.38	1.32
Older and Cancer (CC 8 to 12)	-0.118	0.173	0.468	0.4938	0.89	0.63	1.25
Older and Iron deficiency and other/unspecified anemias and blood disease (CC 47)	-0.240	0.079	9.305	0.0023	0.79	0.67	0.92
Older and Decubitus ulcer or chronic skin ulcer (CC 148, 149)	0.138	0.194	0.503	0.4782	1.15	0.78	1.68
Older and Dementia and Senility (CC 49, 50)	-0.012	0.240	0.002	0.9616	0.99	0.62	1.58
Older and Protein-Calorie Malnutrition (CC 21)	0.144	0.239	0.365	0.5456	1.16	0.72	1.85

Table 10 e. HF Readmission Model with Interaction Terms -- Logistic Regression Model (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	0.0000			
Demographics							
Age	-0.002	0.001	3.039	0.0813	1.00	1.00	1.00
Male	0.024	0.036	0.449	0.5028	1.02	0.95	1.10
Cardiovascular							
Coronary Artery Bypass Graft Surgery	-0.077	0.057	1.849	0.1738	0.93	0.83	1.03
Congestive Heart failure (CC 80)	0.281	0.044	41.753	0.0000	1.32	1.22	1.44
Acute coronary syndrome (CC 81, 82)	0.087	0.052	2.801	0.0942	1.09	0.99	1.21
Arrhythmias (CC 92, 93)	0.210	0.042	25.509	0.0000	1.23	1.14	1.34
Cardio-respiratory failure and shock (CC 79)	0.122	0.051	5.808	0.0160	1.13	1.02	1.25
Valvular or Rheumatic Heart Disease (CC 86)	0.060	0.040	2.235	0.1349	1.06	0.98	1.15
Vascular or Circulatory Disease (CC 104, 105, 106)	0.163	0.045	12.966	0.0003	1.18	1.08	1.29
Chronic atherosclerosis (CC 83, 84)	0.173	0.039	20.197	0.0000	1.19	1.10	1.28
Other and unspecified heart disease (CC 94)	0.024	0.058	0.174	0.6763	1.02	0.91	1.15
Comorbidity							
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	-0.049	0.067	0.531	0.4663	0.95	0.84	1.09
Stroke (CC 95, 96)	0.048	0.107	0.202	0.6532	1.05	0.85	1.29
Renal Failure (CC 131)	0.084	0.048	3.065	0.0800	1.09	0.99	1.20
Chronic Obstructive Pulmonary Disease (CC 108)	0.161	0.038	18.062	0.0000	1.17	1.09	1.26
Diabetes and DM Complications (CC 15 to 20, 119, 120)	0.053	0.037	2.095	0.1478	1.05	0.98	1.13
Disorders of fluid/electrolyte/acid-base (CC 22, 23)	0.265	0.042	38.953	0.0000	1.30	1.20	1.42
Other urinary tract disorders (CC 136)	0.093	0.042	4.810	0.0283	1.10	1.01	1.19
Decubitus ulcer or chronic skin ulcer (CC 148, 149)	0.013	0.062	0.046	0.8300	1.01	0.90	1.15
Other gastrointestinal disorders (CC 36)	0.193	0.038	25.226	0.0000	1.21	1.12	1.31
Peptic ulcer, hemorrhage, other specified gastrointestinal disorders (CC 34)	0.073	0.062	1.376	0.2409	1.08	0.95	1.21
Severe hematological disorders (CC 44)	0.157	0.119	1.741	0.1871	1.17	0.93	1.48
Nephritis (CC 132)	-0.026	0.059	0.200	0.6548	0.97	0.87	1.09
Dementia and Senility (CC 49, 50)	-0.268	0.121	4.885	0.0271	0.76	0.60	0.97
Metastatic Cancer and Acute Leukemia (CC 7)	0.264	0.176	2.264	0.1325	1.30	0.92	1.84

Risk Factor	Estimate	Standard Error	Wald Chi-Square	P-value	OR	LOR	UOR
Cancer (CC 8 to 12)	-0.069	0.078	0.786	0.3755	0.93	0.80	1.09
Liver and biliary disease (CC 25 to 30)	0.197	0.044	19.762	0.0000	1.22	1.12	1.33
End-stage renal disease or dialysis (CC 129, 130)	0.251	0.063	16.009	0.0001	1.29	1.14	1.45
Asthma (CC 110)	0.080	0.050	2.532	0.1115	1.08	0.98	1.20
Iron deficiency and other/unspecified anemias and blood disease (CC 47)	0.244	0.039	39.542	0.0000	1.28	1.18	1.38
Pneumonia (CC 111 to 113)	0.066	0.040	2.781	0.0954	1.07	0.99	1.15
Drug/alcohol abuse/dependence/psychosis (CC 51 to 53)	0.137	0.037	13.797	0.0002	1.15	1.07	1.23
Major pysch disorders (CC 54 to 56)	0.392	0.058	45.414	0.0001	1.48	1.32	1.66
Depression (CC 58)	0.074	0.046	2.622	0.1054	1.08	0.98	1.18
Other psychiatric disorders (CC 60)	0.194	0.056	12.155	0.0005	1.21	1.09	1.35
Fibrosis of lung and other chronic lung disorders (CC 109)	0.145	0.099	2.175	0.1402	1.16	0.95	1.40
Protein-Calorie Malnutrition (CC 21)	0.126	0.078	2.602	0.1067	1.13	0.97	1.32
Older (Age>=65)	0.321	0.063	25.644	0.0000	1.38	1.22	1.56
Interactions							
Older and Male	0.003	0.042	0.006	0.9368	1.00	0.92	1.09
Cardiovascular							
Older and Coronary Artery Bypass Graft Surgery	0.051	0.063	0.664	0.4152	1.05	0.93	1.19
Older and Congestive Heart failure (CC 80)	-0.118	0.052	5.175	0.0229	0.89	0.80	0.98
Older and Acute coronary syndrome (CC 81, 82)	-0.055	0.061	0.806	0.3693	0.95	0.84	1.07
Older and Arrhythmias (CC 92, 93)	-0.155	0.049	10.071	0.0015	0.86	0.78	0.94
Older and Cardio-respiratory failure and shock (CC 79)	-0.046	0.061	0.573	0.4491	0.95	0.85	1.08
Older and Valvular or Rheumatic Heart Disease (CC 86)	0.024	0.046	0.268	0.6046	1.02	0.94	1.12
Older and Vascular or Circulatory Disease (CC 104, 105, 106)	-0.140	0.053	6.971	0.0083	0.87	0.78	0.96
Older and Chronic atherosclerosis (CC 83, 84)	-0.069	0.046	2.243	0.1343	0.93	0.85	1.02
Older and Other and unspecified heart disease (CC 94)	-0.002	0.070	0.001	0.9816	1.00	0.87	1.14
Comorbidity							
Older and Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	0.164	0.080	4.208	0.0402	1.18	1.01	1.38
Older and Stroke (CC 95, 96)	-0.005	0.124	0.001	0.9696	1.00	0.78	1.27
Older and Renal Failure (CC 131)	0.063	0.056	1.253	0.2630	1.06	0.95	1.19
Older and Chronic Obstructive Pulmonary Disease (CC 108)	-0.053	0.044	1.426	0.2324	0.95	0.87	1.03
Older and Diabetes and DM Complications (CC 15 to 20, 119, 120)	0.083	0.043	3.642	0.0563	1.09	1.00	1.18

Risk Factor	Estimate	Standard Error	Wald Chi-Square	P-value	OR	LOR	UOR
Older and Disorders of fluid/electrolyte/acid-base (CC22, 23)	-0.121	0.050	5.879	0.0153	0.89	0.80	0.98
Older and Other urinary tract disorders (CC 136)	0.062	0.049	1.587	0.2077	1.06	0.97	1.17
Older and Decubitus ulcer or chronic skin ulcer (CC 148, 149)	0.139	0.075	3.481	0.0621	1.15	0.99	1.33
Older and Other gastrointestinal disorders (CC 36)	-0.130	0.045	8.441	0.0037	0.88	0.80	0.96
Older and Peptic ulcer, hemorrhage, other specified gastrointestinal disorders (CC 34)	-0.055	0.071	0.590	0.4425	0.95	0.82	1.09
Older and Severe hematological disorders (CC 44)	0.070	0.139	0.253	0.6147	1.07	0.82	1.41
Older and Nephritis (CC 132)	0.019	0.074	0.067	0.7954	1.02	0.88	1.18
Older and Dementia and Senility (CC 49, 50)	0.280	0.125	5.048	0.0247	1.32	1.04	1.69
Older and 'Metastatic Cancer and Acute Leukemia (CC 7)	-0.127	0.195	0.423	0.5154	0.88	0.60	1.29
Older and Cancer (CC 8 to 12)	0.121	0.087	1.953	0.1623	1.13	0.95	1.34
Older and Liver and biliary disease (CC 25 to 30)	-0.089	0.061	2.142	0.1433	0.91	0.81	1.03
Older and End-stage renal disease or dialysis (CC 129, 130)	0.078	0.080	0.935	0.3335	1.08	0.92	1.27
Older and Asthma (CC 110)	-0.102	0.068	2.292	0.1300	0.90	0.79	1.03
Older and Iron deficiency and other/unspecified anemias and blood disease (CC 47)	-0.107	0.045	5.553	0.0184	0.90	0.82	0.98
Older and 'Pneumonia (CC 111 to 113)	-0.008	0.047	0.033	0.8552	0.99	0.91	1.09
Older and Drug/alcohol abuse/dependence/psychosis (CC 51 to 53)	-0.095	0.050	3.678	0.0551	0.91	0.82	1.00
Older and Major pysch disorders (CC 54 to 56)	-0.312	0.079	15.554	0.0001	0.73	0.63	0.85
Older and Depression (CC 58)	-0.042	0.056	0.578	0.4472	0.96	0.86	1.07
Older and Other psychiatric disorders (CC 60)	-0.062	0.069	0.807	0.3690	0.94	0.82	1.08
Older and Fibrosis of lung and other chronic lung disorders (CC 109)	-0.017	0.110	0.024	0.8779	0.98	0.79	1.22
Older and Protein-Calorie Malnutrition (CC 21)	-0.105	0.091	1.335	0.2479	0.90	0.75	1.08

Table 10 f. Pneumonia Readmission Model with Interaction Terms -- Logistic Regression Model (N=74,571, C-Statistic=0.669)

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	-2.702	0.075	1299.610	0.0000			
Demographics							
Age	0.001	0.001	0.415	0.5193	1.00	1.00	1.00
Male	0.139	0.040	11.995	0.0005	1.15	1.06	1.24
Comorbidity							
Coronary Artery Bypass Graft Surgery	-0.309	0.122	6.373	0.0116	0.73	0.58	0.93
History of infection (CC 1, 3 to 6)	0.249	0.055	20.640	0.0000	1.28	1.15	1.43
Septicemia/shock (CC 2)	-0.108	0.077	1.938	0.1639	0.90	0.77	1.04
Metastatic Cancer and Acute Leukemia (CC 7)	0.599	0.097	38.087	0.0000	1.82	1.51	2.20
Lung cancer (CC 8)	0.515	0.104	24.485	0.0000	1.67	1.36	2.05
Lymphatic, head and neck, brain, and other major cancers; breast, prostate, colorectal and other cancers and tumors (CC 9, 10)	0.417	0.077	28.980	0.0000	1.52	1.30	1.77
Diabetes and DM Complications (CC 15 to 20, 119, 120)	0.069	0.044	2.444	0.1180	1.07	0.98	1.17
Protein-Calorie Malnutrition (CC 21)	0.194	0.069	7.965	0.0048	1.21	1.06	1.39
Disorders of fluid/electrolyte/acid-base (CC 22, 23)	0.216	0.052	17.222	0.0000	1.24	1.12	1.37
Other gastrointestinal disorders (CC 36)	0.185	0.043	18.926	0.0000	1.20	1.11	1.31
Severe hematological disorders (CC 44)	0.510	0.084	36.906	0.0000	1.67	1.41	1.96
Iron deficiency and other/unspecified anemias and blood disease (CC 47)	0.175	0.044	15.805	0.0001	1.19	1.09	1.30
Dementia and Senility (CC 49, 50)	0.180	0.097	3.433	0.0639	1.20	0.99	1.45
Drug/alcohol abuse/dependence/psychosis (CC 51 to 53)	0.012	0.043	0.074	0.7850	1.01	0.93	1.10
Major pysch disorders (CC 54 to 56)	0.312	0.057	29.565	0.0000	1.37	1.22	1.53
Other psychiatric disorders (CC 60)	0.264	0.060	19.576	0.0000	1.30	1.16	1.46
Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	0.131	0.071	3.352	0.0671	1.14	0.99	1.31
Cardio-respiratory failure and shock (CC 79)	0.004	0.064	0.003	0.9562	1.00	0.89	1.14
Congestive Heart failure (CC 80)	0.206	0.062	10.970	0.0009	1.23	1.09	1.39
Acute coronary syndrome (CC 81, 82)	0.280	0.102	7.501	0.0062	1.32	1.08	1.62
Chronic atherosclerosis (CC 83, 84)	0.150	0.060	6.312	0.0120	1.16	1.03	1.31
Valvular or Rheumatic Heart Disease (CC 86)	0.069	0.084	0.672	0.4124	1.07	0.91	1.26
Arrhythmias (CC 92, 93)	0.044	0.065	0.461	0.4974	1.05	0.92	1.19
Stroke (CC 95, 96)	0.064	0.145	0.196	0.6583	1.07	0.80	1.42

Risk Factor	Estimate	Standard Error	Wald Chi-Square	P-value	OR	LOR	UOR
Vascular or Circulatory Disease (CC 104, 105, 106)	0.125	0.061	4.261	0.0390	1.13	1.01	1.28
Chronic Obstructive Pulmonary Disease (CC 108)	0.221	0.045	24.381	0.0000	1.25	1.14	1.36
Fibrosis of lung and other chronic lung disorders (CC 109)	0.283	0.073	15.142	0.0001	1.33	1.15	1.53
Asthma (CC 110)	-0.069	0.056	1.504	0.2201	0.93	0.84	1.04
Pneumonia (CC 111 to 113)	0.299	0.052	33.064	0.0000	1.35	1.22	1.49
Pleural effusion/pneumothorax (CC 114)	0.159	0.090	3.144	0.0762	1.17	0.98	1.40
Other lung disorders (CC 115)	0.147	0.052	8.070	0.0045	1.16	1.05	1.28
End-stage renal disease or dialysis (CC 129, 130)	0.347	0.103	11.240	0.0008	1.41	1.15	1.73
Renal Failure (CC 131)	0.190	0.071	7.112	0.0077	1.21	1.05	1.39
Urinary tract infection (CC 135)	0.135	0.068	3.928	0.0475	1.14	1.00	1.31
Other urinary tract disorders (CC 136)	0.164	0.062	7.134	0.0076	1.18	1.04	1.33
Decubitus ulcer or chronic skin ulcer (CC 148, 149)	0.145	0.084	2.961	0.0853	1.16	0.98	1.36
Vertebral fractures (CC 157)	0.281	0.166	2.864	0.0906	1.32	0.96	1.83
Other injuries (CC 162)	0.241	0.080	9.156	0.0025	1.27	1.09	1.49
Older (Age>=65)	0.374	0.068	30.180	0.0000	1.45	1.27	1.66
Interactions							
Older and Male	-0.066	0.047	1.907	0.1673	0.94	0.85	1.03
Comorbidity							
Older and Coronary Artery Bypass Graft Surgery	0.144	0.131	1.218	0.2698	1.16	0.89	1.49
Older and History of infection (CC 1, 3 to 6)	-0.139	0.067	4.240	0.0395	0.87	0.76	0.99
Older and Septicemia/shock (CC 2)	0.114	0.093	1.509	0.2193	1.12	0.93	1.35
Older and Metastatic Cancer and Acute Leukemia (CC 7)	-0.281	0.119	5.599	0.0180	0.76	0.60	0.95
Older and Lung cancer (CC 8)	-0.216	0.123	3.103	0.0781	0.81	0.63	1.02
Older and Lymphatic, head and neck, brain, and other major cancers; breast, prostate, colorectal and other cancers and tumors (CC 9, 10)	-0.338	0.090	14.029	0.0002	0.71	0.60	0.85
Older and Diabetes and DM Complications (CC 15 to 20, 119, 120)	0.062	0.052	1.435	0.2310	1.06	0.96	1.18
Older and Protein-Calorie Malnutrition (CC 21)	0.009	0.080	0.012	0.9141	1.01	0.86	1.18
Older and Disorders of fluid/electrolyte/acid-base (CC 22, 23)	-0.106	0.061	2.983	0.0842	0.90	0.80	1.01
Older and Other gastrointestinal disorders (CC 36)	-0.074	0.050	2.196	0.1383	0.93	0.84	1.02
Older and Severe hematological disorders (CC 44)	-0.207	0.113	3.375	0.0662	0.81	0.65	1.01
Older and Iron deficiency and other/unspecified anemias and blood disease (CC 47)	-0.021	0.051	0.171	0.6789	0.98	0.89	1.08
Older and Dementia and Senility (CC 49, 50)	-0.094	0.101	0.856	0.3550	0.91	0.75	1.11

Risk Factor	Estimate	Standard Error	Wald Chi-Square	P-value	OR	LOR	UOR
Older and Drug/alcohol abuse/dependence/psychosis (CC 51 to 53)	0.011	0.056	0.038	0.8449	1.01	0.91	1.13
Older and Major pysch disorders (CC 54 to 56)	-0.159	0.076	4.429	0.0353	0.85	0.74	0.99
Older and Other psychiatric disorders (CC 60)	-0.182	0.075	5.867	0.0154	0.83	0.72	0.97
Older and Hemiplegia, Paralysis, Functional Disability (CC 67 to 69, 100 to 102, 177, 178)	-0.020	0.087	0.052	0.8190	0.98	0.83	1.16
Older and Cardio-respiratory failure and shock (CC 79)	0.125	0.077	2.635	0.1045	1.13	0.97	1.32
Older and Congestive Heart failure (CC 80)	-0.037	0.071	0.277	0.5988	0.96	0.84	1.11
Older and Acute coronary syndrome (CC 81, 82)	-0.223	0.116	3.693	0.0547	0.80	0.64	1.00
Older and Chronic atherosclerosis (CC 83, 84)	-0.029	0.066	0.193	0.6605	0.97	0.85	1.11
Older and Valvular or Rheumatic Heart Disease (CC 86)	0.055	0.092	0.356	0.5505	1.06	0.88	1.27
Older and Arrhythmias (CC 92, 93)	0.001	0.073	0.000	0.9900	1.00	0.87	1.15
Older and Stroke (CC 95, 96)	-0.120	0.162	0.542	0.4615	0.89	0.65	1.22
Older and Vascular or Circulatory Disease (CC 104, 105, 106)	-0.118	0.070	2.816	0.0933	0.89	0.77	1.02
Older and Chronic Obstructive Pulmonary Disease (CC 108)	-0.005	0.052	0.009	0.9266	1.00	0.90	1.10
Older and Fibrosis of lung and other chronic lung disorders (CC 109)	-0.108	0.085	1.646	0.1995	0.90	0.76	1.06
Older and Asthma (CC 110)	0.032	0.075	0.178	0.6731	1.03	0.89	1.20
Older and Pneumonia (CC 111 to 113)	-0.181	0.061	8.773	0.0031	0.83	0.74	0.94
Older and Pleural effusion/pneumothorax (CC 114)	-0.183	0.110	2.792	0.0948	0.83	0.67	1.03
Older and Other lung disorders (CC 115)	-0.148	0.062	5.640	0.0176	0.86	0.76	0.97
Older and End-stage renal disease or dialysis (CC 129, 130)	-0.025	0.130	0.037	0.8472	0.98	0.76	1.26
Older and Renal Failure (CC 131)	-0.038	0.081	0.212	0.6451	0.96	0.82	1.13
Older and Urinary tract infection (CC 135)	-0.028	0.079	0.075	0.7839	0.98	0.84	1.14
Older and Other urinary tract disorders (CC 136)	-0.106	0.070	2.318	0.1279	0.90	0.78	1.03
Older and Decubitus ulcer or chronic skin ulcer (CC 148, 149)	-0.059	0.099	0.359	0.5492	0.94	0.78	1.14
Older and Vertebral fractures (CC 157)	-0.061	0.180	0.117	0.7324	0.94	0.66	1.34
Older and Other injuries (CC 162)	-0.142	0.092	2.390	0.1221	0.87	0.72	1.04

Table 11 a. AMI Mortality Model Performance for Models with Interaction Terms by Patient Subgroup
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	(-[#], 35.17%)
FFS, 65+	13,347	0.712	0.006	0.700	0.723	(-[#], 35.12%)
Non-FFS, 65+	11,214	0.715	0.007	0.702	0.728	(-[#], 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.
[#] There are no discharges in the lowest decile for this patient subgroup.

Table 11 b. HF 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+	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 11 c. Pneumonia 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+	48,401	0.719	0.003	0.712	0.726	(0.00%, 30.98%)
FFS, 65+	31,580	0.719	0.004	0.711	0.727	(0.00%, 29.27%)
Non-FFS, 65+	16,821	0.723	0.006	0.712	0.734	(0.00%, 34.83%)
All 18-64	20,846	0.784	0.008	0.768	0.800	(1.21%, 29.64%)
All 18+	**69,247**	**0.759**	**0.003**	**0.754**	**0.765**	**(1.21%, 30.85%)**

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

Table 11 d. AMI Readmission 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+	23,029	0.628	0.005	0.618	0.637	(-[#], 28.27%)
FFS, 65+	12,360	0.625	0.006	0.612	0.637	(-[#], 32.51%)
Non-FFS, 65+	10,669	0.631	0.007	0.618	0.645	(-[#], 37.57%)
All 18-64	15,545	0.688	0.007	0.674	0.702	(5.33%, 26.98%)
All 18+	**38,574**	**0.673**	**0.004**	**0.665**	**0.680**	**(5.33%, 31.81%)**

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

[#] There are no discharges in the lowest decile for this patient subgroup.

Table 11 e. HF Readmission 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+	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 11 f. Pneumonia Readmission 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+	51,131	0.638	0.003	0.631	0.644	(0.00%, 33.24%)
FFS, 65+	32,778	0.641	0.004	0.634	0.649	(0.00%, 33.09%)
Non-FFS, 65+	18,353	0.630	0.006	0.619	0.641	(0.00%, 33.63%)
All 18-64	23,440	0.722	0.005	0.713	0.731	(6.26%, 39.34%)
All 18+	**74,571**	**0.669**	**0.003**	**0.663**	**0.674**	**(6.25%, 35.50%)**

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

Table 12 a. 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 Interaction	Model With Interaction									
	0 to <5%		5% to <10%		10% to <20%		>=20%		Total	
	#	Column %	#	Column %	#	Column %	#	Column %	#	
Among All 18+ Patients										
Risk Category										
0 to <5%	11,400	92.46	697	7.17	9	0.09	0	0.00	12,106	
5% to <10%	930	7.54	8,797	90.53	1,024	9.72	11	0.16	10,762	Same category: 90.84
10% to <20%	0	0.00	223	2.29	9,195	87.31	417	6.04	9,835	Similar category: 99.95
>=20%	0	0.00	0	0.00	303	2.88	6,475	93.80	6,778	NRI=0.0095; p=0.0301
Total	12,330	-	9,717	-	10,531	-	6,903	-	39,481	IDI=-0.0009; p=0.0185
In All 65+ Patients										
Risk Category										
0 to <5%	1,156	98.55	277	3.89	0	0.00	0	0.00	1,433	
5% to <10%	17	1.45	6,678	93.81	590	6.09	0	0.00	7,285	Same category: 93.54
10% to <20%	0	0.00	164	2.30	8,791	90.81	239	3.63	9,194	Similar category: 100.00
>=20%	0	0.00	0	0.00	300	3.10	6,349	96.37	6,649	NRI=-0.0232; p<0.0001
Total	1,173	-	7,119	-	9,681	-	6,588	-	24,561	IDI=0.0029; p<0.0001
In FFS 65+ Patients										
Risk Category										
0 to <5%	573	98.28	137	3.77	0	0.00	0	0.00	710	
5% to <10%	10	1.72	3,408	93.83	314	5.98	0	0.00	3,732	Same category: 93.55
10% to <20%	0	0.00	87	2.40	4,761	90.74	140	3.60	4,988	Similar category: 99.99
>=20%	0	0.00	0	0.00	172	3.28	3,745	96.40	3,917	NRI=-0.0253; p<0.0001
Total	583	-	3,632	-	5,247	-	3,885	-	13,347	IDI=0.0032; p<0.0001
In Non-FFS 65+ Patients										
Risk Category										
0 to <5%	583	98.81	140	4.01	0	0.00	0	0.00	723	
5% to <10%	7	1.19	3,270	93.78	276	6.22	0	0.00	3,553	Same category: 93.52
10% to <20%	0	0.00	77	2.21	4,030	90.89	99	3.66	4,206	Similar category: 100.00
>=20%	0	0.00	0	0.00	128	2.89	2,604	96.34	2,732	NRI=-0.0204; p=0.0005
Total	590	-	3,487	-	4,434	-	2,703	-	11,214	IDI=0.0025; p<0.0001
In All 18-64 Patients										
Risk Category										
0 to <5%	10,244	91.82	420	16.17	9	1.06	0	0.00	10,673	
5% to <10%	913	8.18	2,119	81.56	434	51.06	11	3.49	3,477	Same category: 86.41
10% to <20%	0	0.00	59	2.27	404	47.53	178	56.51	641	Similar category: 99.87
>=20%	0	0.00	0	0.00	3	0.35	126	40.00	129	NRI=0.1469; p<0.0001
Total	11,157	-	2,598	-	850	-	315	-	14,920	IDI=-0.0216; p<0.0001

Table 12 b. 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	
	#	Column %	#	Column %	#	Column %	#	Column %	#	
Among All 18+ Patients										
Risk Category										
0 to <5%	16,018	94.71	1,053	5.08	17	0.10	0	0.00	17,088	
5% to <10%	892	5.27	19,056	91.89	752	4.33	6	0.12	20,706	Same category: 93.52
10% to <20%	3	0.02	629	3.03	16,345	94.19	301	6.00	17,278	Similar category: 99.96
>=20%	0	0.00	0	0.00	239	1.38	4,711	93.88	4,950	NRI=0.0074; p=0.0276
Total	16,913	-	20,738	-	17,353	-	5,018	-	60,022	IDI=-0.0008; p<0.0001
In All 65+ Patients										
Risk Category										
0 to <5%	4,422	92.74	126	0.70	0	0.00	0	0.00	4,548	
5% to <10%	346	7.26	17,404	96.32	395	2.37	0	0.00	18,145	Same category: 95.80
10% to <20%	0	0.00	539	2.98	16,056	96.28	233	4.75	16,828	Similar category: 99.99
>=20%	0	0.00	0	0.00	226	1.36	4,677	95.25	4,903	NRI=0.0084; p=0.0036
Total	4,768	-	18,069	-	16,677	-	4,910	-	44,424	IDI=-0.0003; p=0.0076
In FFS 65+ Patients										
Risk Category										
0 to <5%	2,707	92.61	71	0.64	0	0.00	0	0.00	2,778	
5% to <10%	216	7.39	10,685	96.26	222	2.08	0	0.00	11,123	Same category: 95.85
10% to <20%	0	0.00	344	3.10	10,315	96.49	155	4.75	10,814	Similar category: 99.99
>=20%	0	0.00	0	0.00	153	1.43	3,109	95.25	3,262	NRI=0.0089; p=0.0168
Total	2,923	-	11,100	-	10,690	-	3,264	-	27,977	IDI=-0.0004; p=0.0036
In Non-FFS 65+ Patients										
Risk Category										
0 to <5%	1,715	92.95	55	0.79	0	0.00	0	0.00	1,770	
5% to <10%	130	7.05	6,719	96.41	173	2.89	0	0.00	7,022	Same category: 95.72
10% to <20%	0	0.00	195	2.80	5,741	95.89	78	4.74	6,014	Similar category: 99.99
>=20%	0	0.00	0	0.00	73	1.22	1,568	95.26	1,641	NRI=0.0075; p=0.1043
Total	1,845	-	6,969	-	5,987	-	1,646	-	16,447	IDI=-0.0001; p=0.5817
In All 18-64 Patients										
Risk Category										
0 to <5%	11,596	95.48	927	34.73	17	2.51	0	0.00	12,540	
5% to <10%	546	4.50	1,652	61.90	357	52.81	6	5.56	2,561	Same category: 87.00
10% to <20%	3	0.02	90	3.37	289	42.75	68	62.96	450	Similar category: 99.83
>=20%	0	0.00	0	0.00	13	1.92	34	31.48	47	NRI=0.0817; p<0.0001
Total	12,145	-	2,669	-	676	-	108	-	15,598	IDI=-0.0080; p<0.0001

Table 12 c. Reclassification Table of Risk Categories for Pneumonia 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	
	#	Column %	#	Column %	#	Column %	#	Column %	#	
Among All 18+ Patients										
Risk Category										
0 to <5%	20,740	97.07	889	4.11	1	0.01	0	0.00	21,630	
5% to <10%	626	2.93	20,394	94.32	966	5.58	0	0.00	21,986	Same category: 94.51
10% to <20%	0	0.00	339	1.57	16,004	92.40	627	7.01	16,970	Similar category: 99.99
>=20%	0	0.00	0	0.00	349	2.02	8,312	92.99	8,661	NRI=0.0027; p=0.3820
Total	21,366	-	21,622	-	17,320	-	8,939	-	69,247	IDI=-0.0004; p=0.1972
In All 65+ Patients										
Risk Category										
0 to <5%	4,546	98.48	514	2.65	0	0.00	0	0.00	5,060	
5% to <10%	70	1.52	18,599	95.87	665	4.07	0	0.00	19,334	Same category: 95.62
10% to <20%	0	0.00	288	1.48	15,311	93.81	235	2.91	15,834	Similar category: 99.99
>=20%	0	0.00	0	0.00	346	2.12	7,827	97.09	8,173	NRI=-0.0123; p<0.0001
Total	4,616	-	19,401	-	16,322	-	8,062	-	48,401	IDI=0.0036; p<0.0001
In FFS 65+ Patients										
Risk Category										
0 to <5%	2,769	98.40	321	2.63	0	0.00	0	0.00	3,090	
5% to <10%	45	1.60	11,716	95.82	454	4.15	0	0.00	12,215	Same category: 95.60
10% to <20%	0	0.00	190	1.55	10,272	93.79	154	2.76	10,616	Similar category: 100.01
>=20%	0	0.00	0	0.00	226	2.06	5,433	97.24	5,659	NRI=-0.0080; p=0.0224
Total	2,814	-	12,227	-	10,952	-	5,587	-	31,580	IDI=0.0037; p<0.0001
In Non-FFS 65+ Patients										
Risk Category										
0 to <5%	1,777	98.61	193	2.69	0	0.00	0	0.00	1,970	
5% to <10%	25	1.39	6,883	95.94	211	3.93	0	0.00	7,119	Same category: 95.67
10% to <20%	0	0.00	98	1.37	5,039	93.84	81	3.27	5,218	Similar category: 99.99
>=20%	0	0.00	0	0.00	120	2.23	2,394	96.73	2,514	NRI=-0.0197; p<0.0001
Total	1,802	-	7,174	-	5,370	-	2,475	-	16,821	IDI=0.0034; p<0.0001
In All 18-64 Patients										
Risk Category										
0 to <5%	16,194	96.68	375	16.88	1	0.10	0	0.00	16,570	
5% to <10%	556	3.32	1,795	80.82	301	30.16	0	0.00	2,652	Same category: 91.94
10% to <20%	0	0.00	51	2.30	693	69.44	392	44.70	1,136	Similar category: 99.98
>=20%	0	0.00	0	0.00	3	0.30	485	55.30	488	NRI=0.1035; p<0.0001
Total	16,750	-	2,221	-	998	-	877	-	20,846	IDI=-0.0276; p=0.5961

Table 12 d. Reclassification Table of Risk Categories for AMI 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 <10%		10% to <15%		15% to <25%		>=25%		Total	
	#	Column %	#	Column %	#	Column %	#	Column %	#	
Among All 18+ Patients										
Risk Categories										
0 to <10%	9,322	83.01	1,592	14.19	0	0.00	0	0.00	10,914	
10% to <15%	1,908	16.99	9,445	84.20	1,854	15.35	1	0.02	13,208	Same category: 82.89
15% to <25%	0	0.00	181	1.61	9,598	79.47	441	10.89	10,220	Similar category: 100.01
>=25%	0	0.00	0	0.00	625	5.18	3,607	89.08	4,232	NRI=0.0153; p=0.0078
Total	11,230	-	11,218	-	12,077	-	4,049	-	38,574	IDI=-0.0039; p<0.0001
In All 65+ Patients										
Risk Categories										
0 to <10%	636	100.00	1,497	17.58	0	0.00	0	0.00	2,133	
10% to <15%	0	0.00	6,973	81.89	1,555	14.43	0	0.00	8,528	Same category: 83.69
15% to <25%	0	0.00	45	0.53	8,615	79.95	54	1.74	8,714	Similar category: 100.00
>=25%	0	0.00	0	0.00	606	5.62	3,048	98.26	3,654	NRI=-0.0552; p<0.0001
Total	636	-	8,515	-	10,776	-	3,102	-	23,029	IDI=0.0059; p<0.0001
In FFS 65+ Patients										
Risk Categories										
0 to <10%	333	100.00	725	16.69	0	0.00	0	0.00	1,058	
10% to <15%	0	0.00	3,592	82.69	830	14.15	0	0.00	4,422	Same category: 84.38
15% to <25%	0	0.00	27	0.62	4,717	80.40	27	1.49	4,771	Similar category: 100.00
>=25%	0	0.00	0	0.00	320	5.45	1,789	98.51	2,109	NRI=-0.0543; p<0.0001
Total	333	-	4,344	-	5,867	-	1,816	-	12,360	IDI=0.0057; p<0.0001
In Non-FFS 65+ Patients										
Risk Categories										
0 to <10%	303	100.00	772	18.51	0	0.00	0	0.00	1,075	
10% to <15%	0	0.00	3,381	81.06	725	14.77	0	0.00	4,106	Same category: 82.87
15% to <25%	0	0.00	18	0.43	3,898	79.41	27	2.10	3,943	Similar category: 100.01
>=25%	0	0.00	0	0.00	286	5.83	1,259	97.90	1,545	NRI=0.0564; p<0.0001
Total	303	-	4,171	-	4,909	-	1,286	-	10,669	IDI=0.0060; p<0.0001
In All 18-64 Patients										
Risk Categories										
0 to <10%	8,686	81.99	95	3.51	0	0.00	0	0.00	8,781	
10% to <15%	1,908	18.01	2,472	91.45	299	22.98	1	0.11	4,680	Same category: 81.70
15% to <25%	0	0.00	136	5.03	983	75.56	387	40.87	1,506	Similar category: 99.98
>=25%	0	0.00	0	0.00	19	1.46	559	59.03	578	NRI=0.0926; p<0.0001
Total	10,594	-	2,703	-	1,301	-	947	-	15,545	IDI=-0.0247; p<0.0001

Table 12 e. 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	
	#	Column %	#	Column %	#	Column %	#	Column %	#	Column %	#	
Among All 18+ Patients												
Risk Category												
0 to <15%	8,836	73.16	3,793	16.40	0	0.00	0	0.00	0	0.00	12,629	
15% to <20%	3,236	26.79	17,751	76.73	1,669	11.44	0	0.00	0	0.00	22,656	
20% to <25%	5	0.04	1,576	6.81	11,226	76.95	1,080	10.13	13	0.08	13,900	Same category: 79.00
25% to <30%	0	0.00	14	0.06	1,672	11.46	7,731	72.53	1,140	7.09	10,557	Similar category: 99.92
>=30%	0	0.00	0	0.00	21	0.14	1,848	17.34	14,925	92.83	16,794	NRI=0.0010; p=0.7895
Total	12,077	-	23,134	-	14,588	-	10,659	-	16,078	-	76,536	IDI=-0.0032; p<0.0001
In All 65+ Patients												
Risk Category												
0 to <15%	5,451	99.42	3,793	19.90	0	0.00	0	0.00	0	0.00	9,244	
15% to <20%	32	0.58	14,703	77.12	1,548	12.99	0	0.00	0	0.00	16,283	
20% to <25%	0	0.00	568	2.98	9,102	76.35	621	7.37	0	0.00	10,291	Same category: 82.25
25% to <30%	0	0.00	0	0.00	1,264	10.60	6,226	73.88	311	3.15	7,801	Similar category: 99.99
>=30%	0	0.00	0	0.00	7	0.06	1,580	18.75	9,567	96.85	11,154	NRI=-0.0359; p<0.0001
Total	5,483	-	19,064	-	11,921	-	8,427	-	9,878	-	54,773	IDI=0.0041; p<0.0001
In FFS 65+ Patients												
Risk Category												
0 to <15%	3,212	99.35	2,218	19.42	0	0.00	0	0.00	0	0.00	5,430	
15% to <20%	21	0.65	8,854	77.53	918	12.37	0	0.00	0	0.00	9,793	
20% to <25%	0	0.00	348	3.05	5,684	76.61	391	7.36	0	0.00	6,423	Same category: 82.43
25% to <30%	0	0.00	0	0.00	813	10.96	3,896	73.34	198	3.09	4,907	Similar category: 100.00
>=30%	0	0.00	0	0.00	4	0.05	1,025	19.30	6,202	96.91	7,231	NRI=-0.0384; p<0.0001
Total	3,233	-	11,420	-	7,419	-	5,312	-	6,400	-	33,784	IDI=0.0042; p<0.0001
In Non-FFS 65+ Patients												
Risk Category												
0 to <15%	2,239	99.51	1,575	20.60	0	0.00	0	0.00	0	0.00	3,814	
15% to <20%	11	0.49	5,849	76.52	630	13.99	0	0.00	0	0.00	6,490	

Model Without Interaction	Model With Interaction											
	0 to <15%		15% to <20%		20% to <25%		25% to <30%		>=30%		Total	
	#	Column %	#	Column %	#	Column %	#	Column %	#	Column %	#	
20% to <25%	0	0.00	220	2.88	3,418	75.92	230	7.38	0	0.00	3,868	Same category: 81.95
25% to <30%	0	0.00	0	0.00	451	10.02	2,330	74.80	113	3.25	2,894	Similar category: 99.98
>=30%	0	0.00	0	0.00	3	0.07	555	17.82	3,365	96.75	3,923	NRI=-0.0308; p<0.0001
Total	2,250	-	7,644	-	4,502	-	3,115	-	3,478	-	20,989	IDI=0.0038; p<0.0001
In All 18-64 Patients												
Risk Category												
0 to <15%	3,385	51.33	0	0.00	0	0.00	0	0.00	0	0.00	3,385	
15% to <20%	3,204	48.59	3,048	74.89	121	4.54	0	0.00	0	0.00	6,373	
20% to <25%	5	0.08	1,008	24.77	2,124	79.64	459	20.56	13	0.21	3,609	Same category: 70.86
25% to <30%	0	0.00	14	0.34	408	15.30	1,505	67.43	829	13.37	2,756	Similar category: 99.79
>=30%	0	0.00	0	0.00	14	0.52	268	12.01	5,358	86.42	5,640	NRI=0.1026; p<0.0001
Total	6,594	-	4,070	-	2,667	-	2,232	10.26	6,200	-	21,763	IDI=-0.0207; p=0.9298

Table 12 f. Reclassification Table of Risk Categories for Pneumonia 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 <10%		10% to <15%		15% to <20%		>=20%		Total	
	#	Column %	#	Column %	#	Column %	#	Column %	#	
Among All 18+ Patients										
Risk Category										
0 to <10%	9,087	69.11	3,511	11.84	0	0.00	0	0.00	12,598	
10% to <15%	4,061	30.89	25,164	84.85	2,152	15.46	0	0.00	31,377	Same category: 82.89
15% to <20%	0	0.00	983	3.31	10,773	77.39	1,068	5.99	12,824	Similar category: 100.03
>=20%	0	0.00	0	0.00	996	7.15	16,776	94.01	17,772	NRI=0.0103; p=0.0057
Total	13,148	-	29,658	-	13,921	-	17,844	-	74,571	IDI=-0.0033; p<0.0001
In All 65+ Patients										
Risk Category										
0 to <10%	2,272	100.00	3,489	14.36	0	0.00	0	0.00	5,761	
10% to <15%	0	0.00	20,427	84.10	1,880	16.13	0	0.00	22,307	Same category: 86.24
15% to <20%	0	0.00	374	1.54	8,922	76.55	440	3.41	9,736	Similar category: 100.00
>=20%	0	0.00	0	0.00	853	7.32	12,474	96.59	13,327	NRI=-0.0422; p<0.0001
Total	2,272	-	24,290	-	11,655	-	12,914	-	51,131	IDI=0.0057; p<0.0001
In FFS 65+ Patients										
Risk Category										
0 to <10%	1,343	100.00	2,067	13.80	0	0.00	0	0.00	3,410	
10% to <15%	0	0.00	12,692	84.71	1,164	15.41	0	0.00	13,856	Same category: 86.84
15% to <20%	0	0.00	224	1.50	5,830	77.17	298	3.35	6,352	Similar category: 100.00
>=20%	0	0.00	0	0.00	561	7.43	8,599	96.65	9,160	NRI=-0.0389; p<0.0001
Total	1,343	-	14,983	-	7,555	-	8,897	-	32,778	IDI=0.0059; p<0.0001
In Non-FFS 65+ Patients										
Risk Category										
0 to <10%	929	100.00	1,422	15.28	0	0.00	0	0.00	2,351	
10% to <15%	0	0.00	7,735	83.11	716	17.46	0	0.00	8,451	Same category: 85.17
15% to <20%	0	0.00	150	1.61	3,092	75.41	142	3.53	3,384	Similar category: 100.00
>=20%	0	0.00	0	0.00	292	7.12	3,875	96.47	4,167	NRI=-0.0476; p<0.0001
Total	929	-	9,307	-	4,100	-	4,017	-	18,353	IDI=0.0053; p<0.0001
In All 18-64 Patients										
Risk Category										
0 to <10%	6,815	62.66	22	0.41	0	0.00	0	0.00	6,837	
10% to <15%	4,061	37.34	4,737	88.25	272	12.00	0	0.00	9,070	Same category: 75.53
15% to <20%	0	0.00	609	11.35	1,851	81.69	628	12.74	3,088	Similar category: 100.00
>=20%	0	0.00	0	0.00	143	6.31	4,302	87.26	4,445	NRI=0.1089; p<0.0001
Total	10,876	-	5,368	-	2,266	-	4,930	-	23,440	IDI=-0.0253; p<0.0001

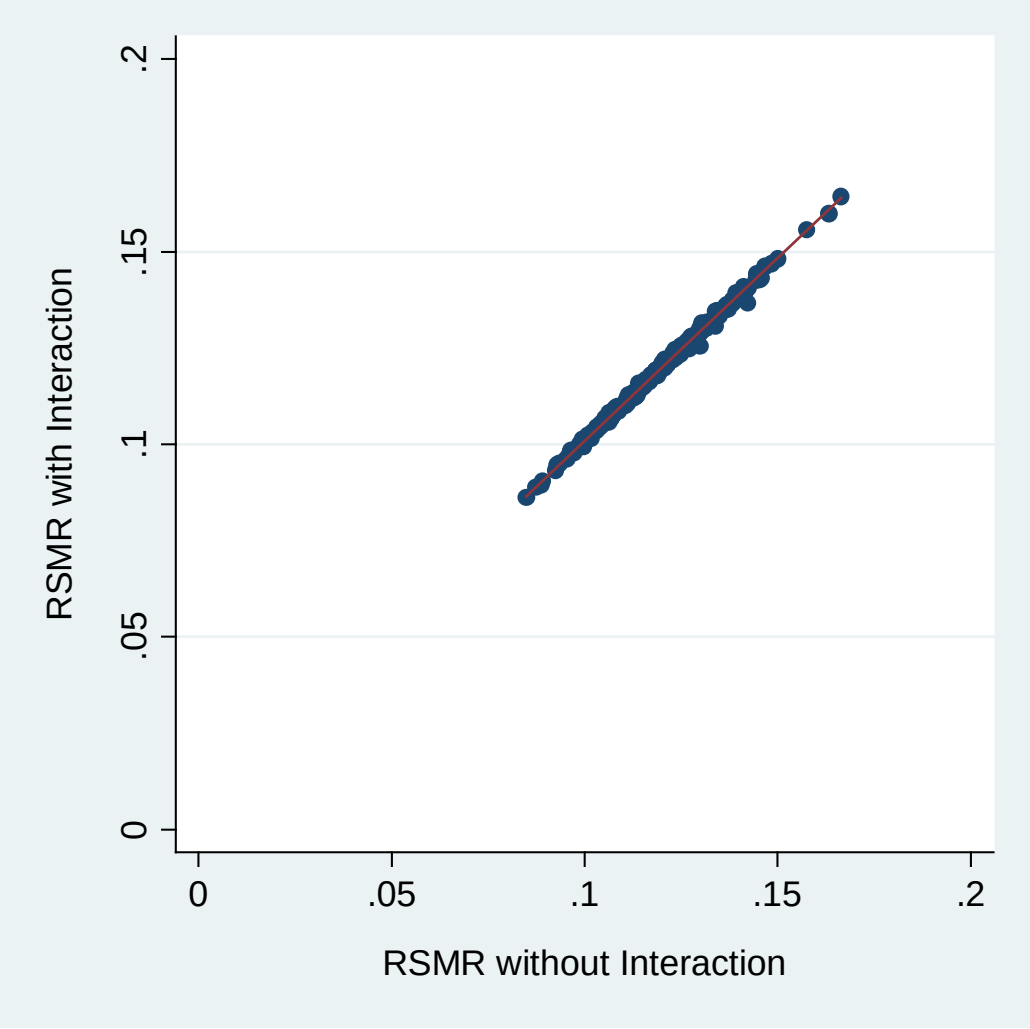
Table 13 a. AMI Mortality Model Performance for Models With and Without Interaction Terms (N = 39,481)

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

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

Figure 4 a. 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



Intra-class Correlation Coefficients (ICC): 0.998

Note: 1) RSMRs are in proportions.
2) Diagonal line represents the fitted line.

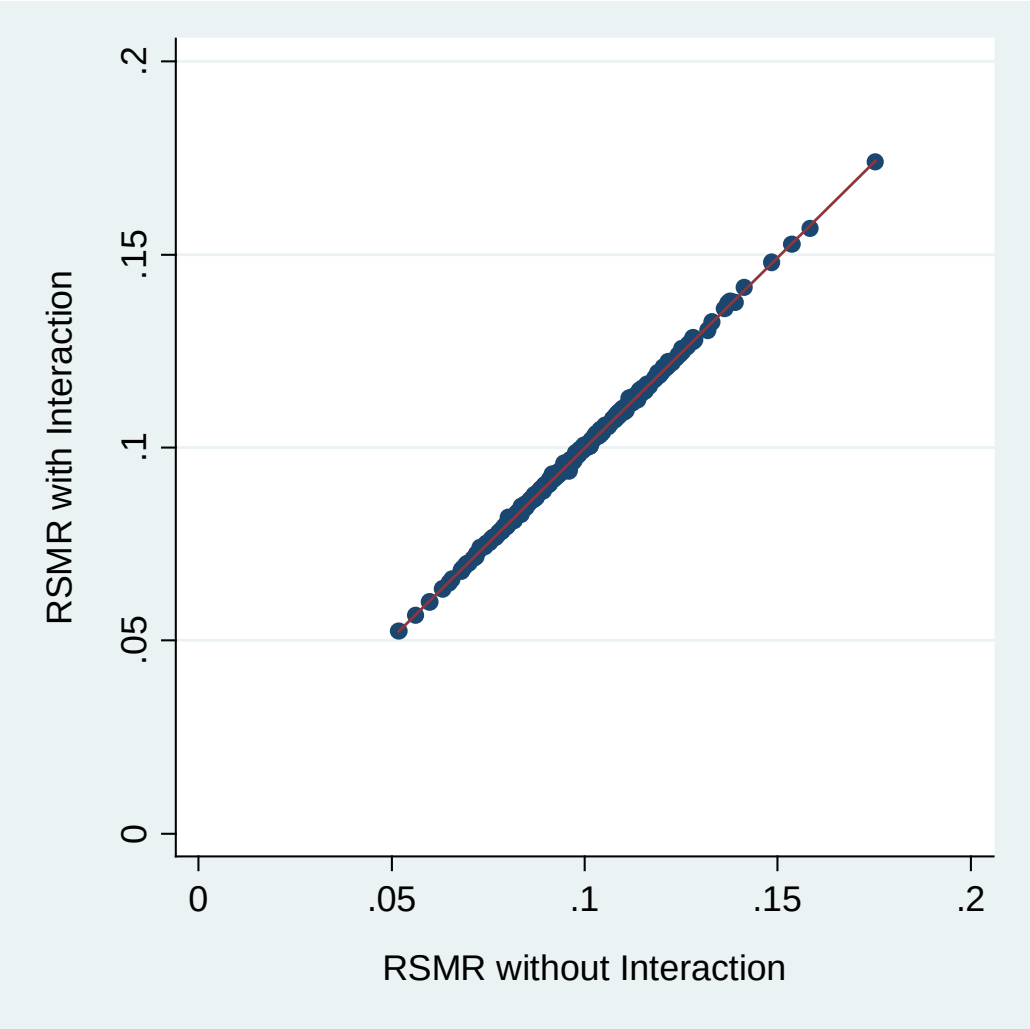
Table 13 b. HF Mortality Model Performance for Models With and Without Interaction Terms (N = 60,022)

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

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

Figure 4 b. 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



Intra-class Correlation Coefficients (ICC): 1.000

Note: 1) RSMRs are in proportions.
2) Diagonal line represents the fitted line.

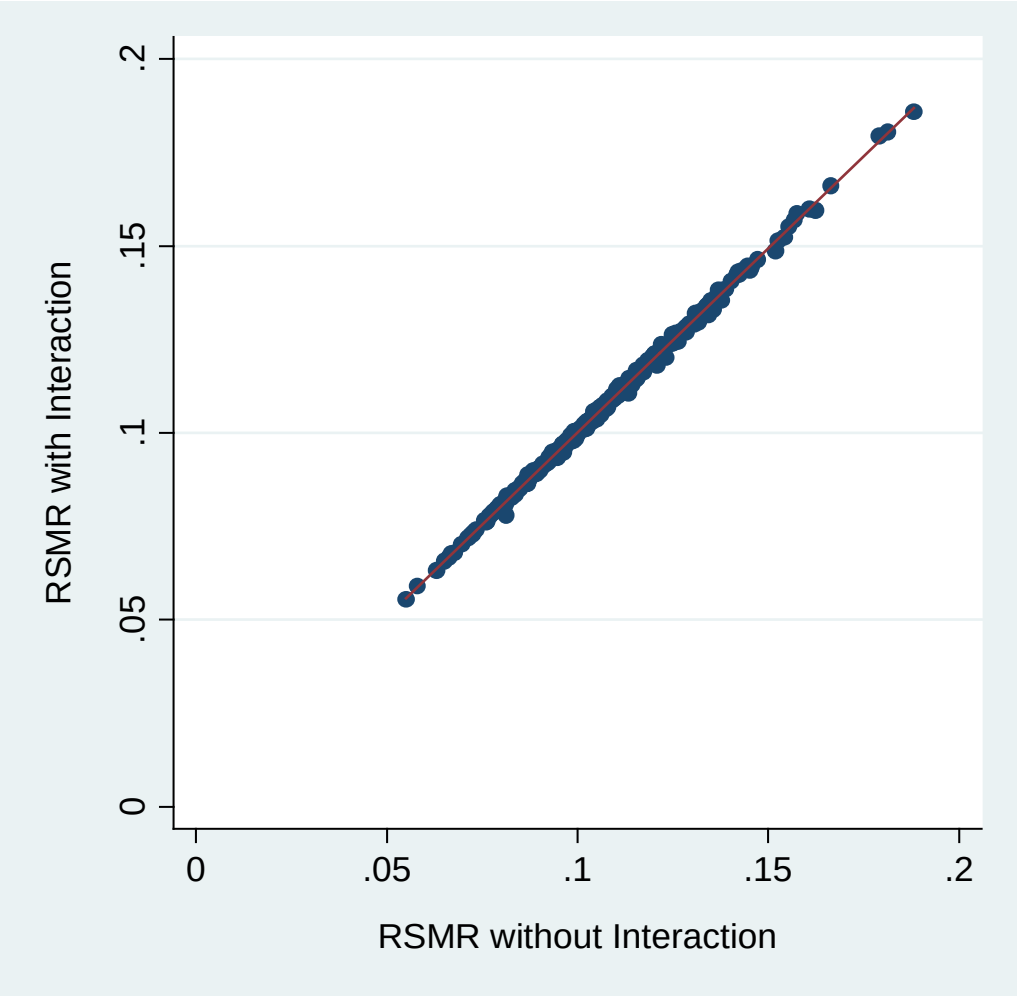
Table 13 c. Pneumonia Mortality Model Performance for Models With and Without Interaction Terms (N= 69,247)

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

Pneumonia Mortality Model	C-statistic	SE	Lower C-stat	Upper C-stat
With interaction terms	0.759	0.003	0.754	0.765
Without interaction terms	0.759	0.003	0.753	0.764

Figure 4 c. Scatterplot of Pneumonia 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



Intra-class Correlation Coefficients (ICC): 0.999

Note: 1) RSMRs are in proportions.
2) Diagonal line represents the fitted line.

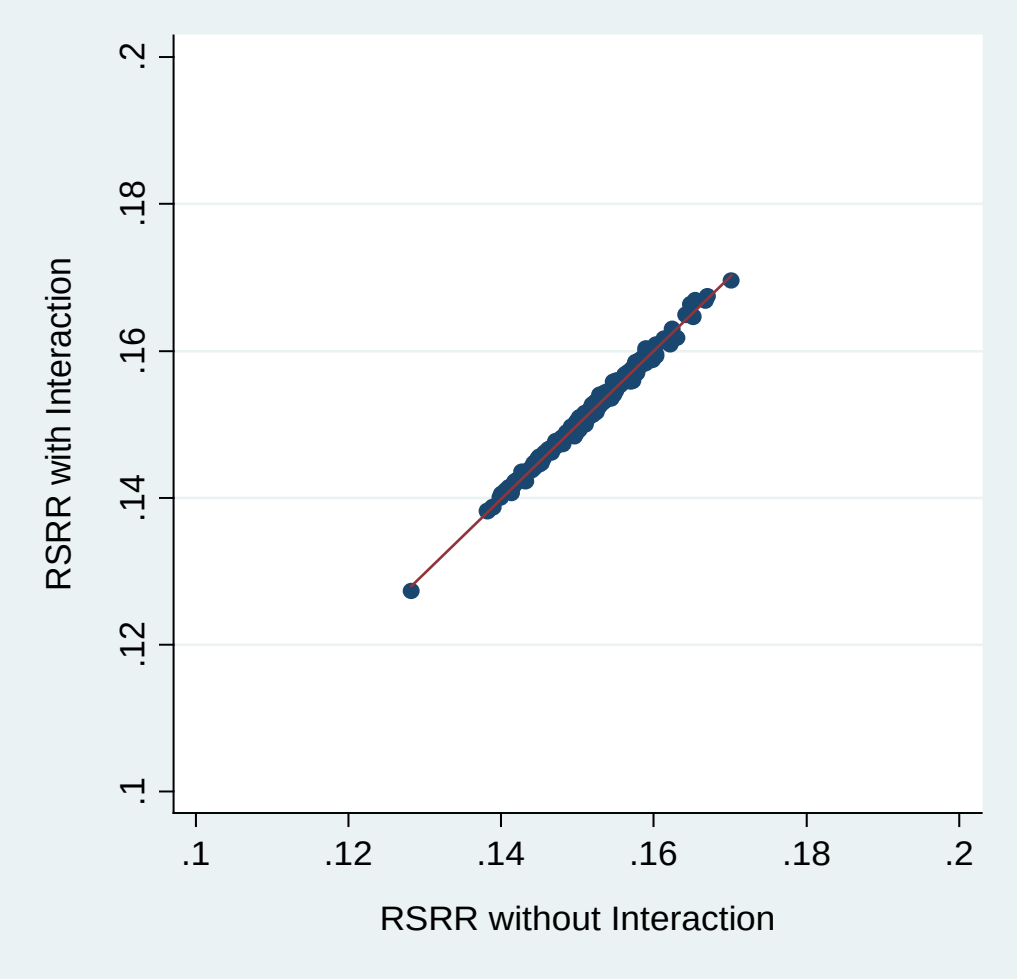
Table 13 d. AMI Readmission Model Performance for Models With and Without Interaction Terms (N= 38,574)

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

AMI Readmission Model	C-statistic	SE	Lower C-stat	Upper C-stat
With interaction terms	0.673	0.004	0.665	0.680
Without interaction terms	0.670	0.004	0.662	0.677

Figure 4 d. Scatterplot of AMI 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



Intra-class Correlation Coefficients (ICC): 0.998

Note: 1) RSRRs are in proportions.
2) Diagonal line represents the fitted line.

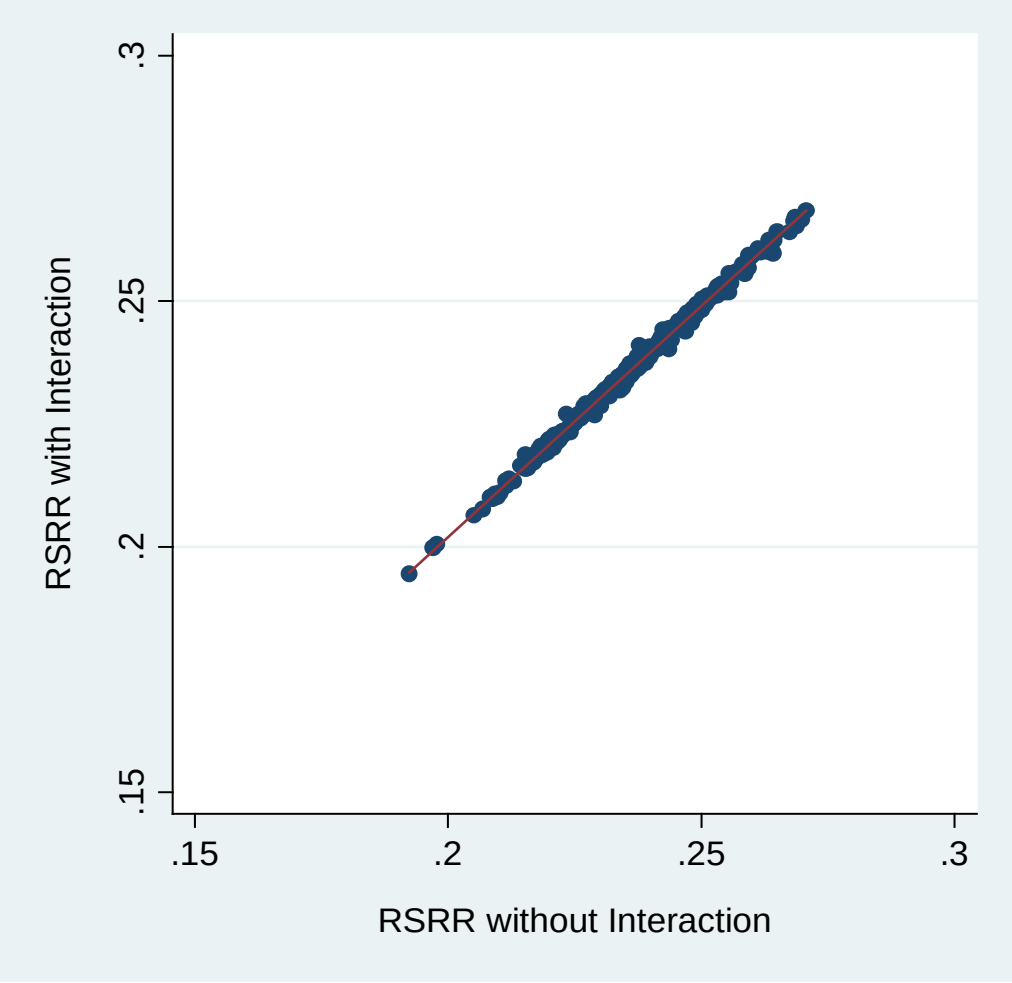
Table 13 e. HF Readmission Model Performance for Models With and Without Interaction Terms (N = 76,536)

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

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

Figure 4 e. 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



Intra-class Correlation Coefficients (ICC): 0.996

Note: 1) RSRRs are in proportions.
2) Diagonal line represents the fitted line.

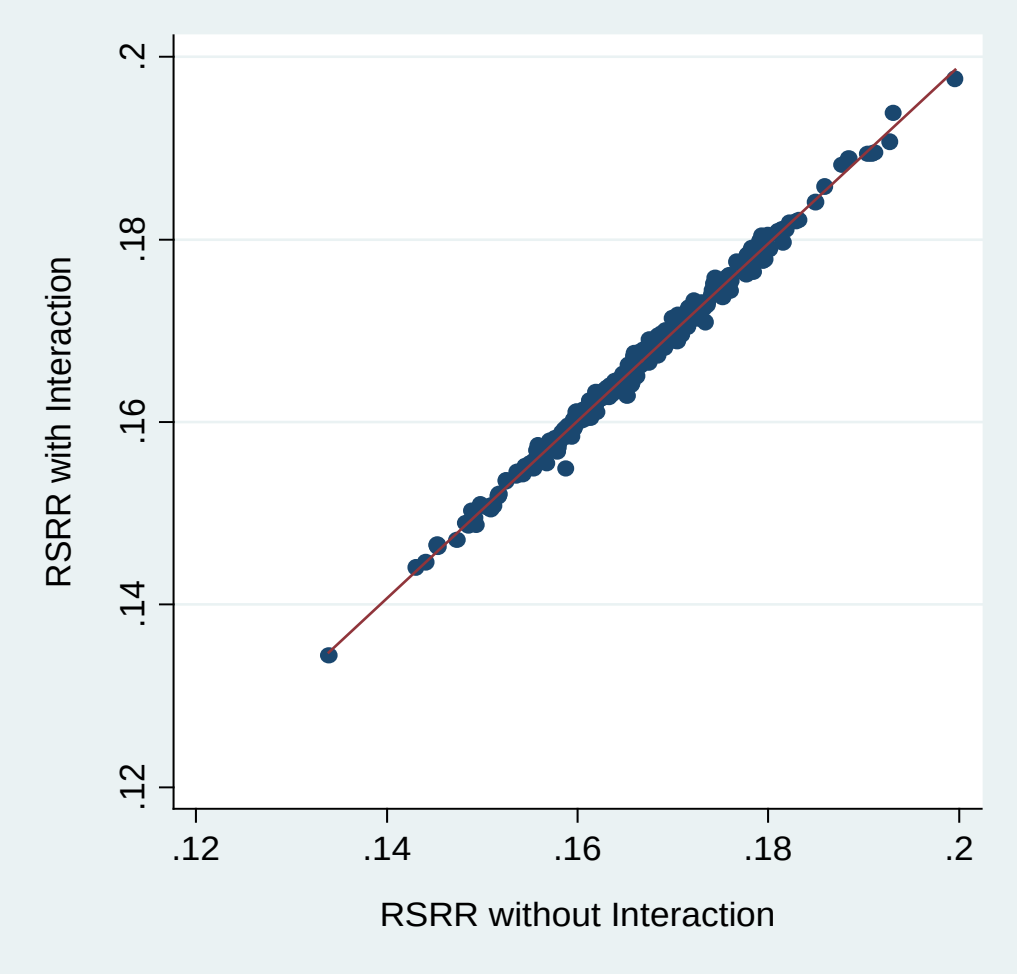
Table 13 f. Pneumonia Readmission Model Performance for Models With and Without Interaction Terms (N = 74,571)

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

Pneumonia Readmission Model	C-statistic	SE	Lower C-stat	Upper C-stat
With interaction terms	0.669	0.003	0.663	0.674
Without interaction terms	0.666	0.003	0.661	0.671

Figure 4 f. Scatterplot of Pneumonia 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



Intra-class Correlation Coefficients (ICC): 0.997

Note: 1) RSRRs are in proportions.
2) Diagonal line represents the fitted line.