

Acute Myocardial Infarction (AMI) Excess Days in Acute Care (EDAC) Measure Submission to PQM: Figures and Tables

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Figure 1. Planned Readmission Algorithm Version 4.0 2024 Flowchart

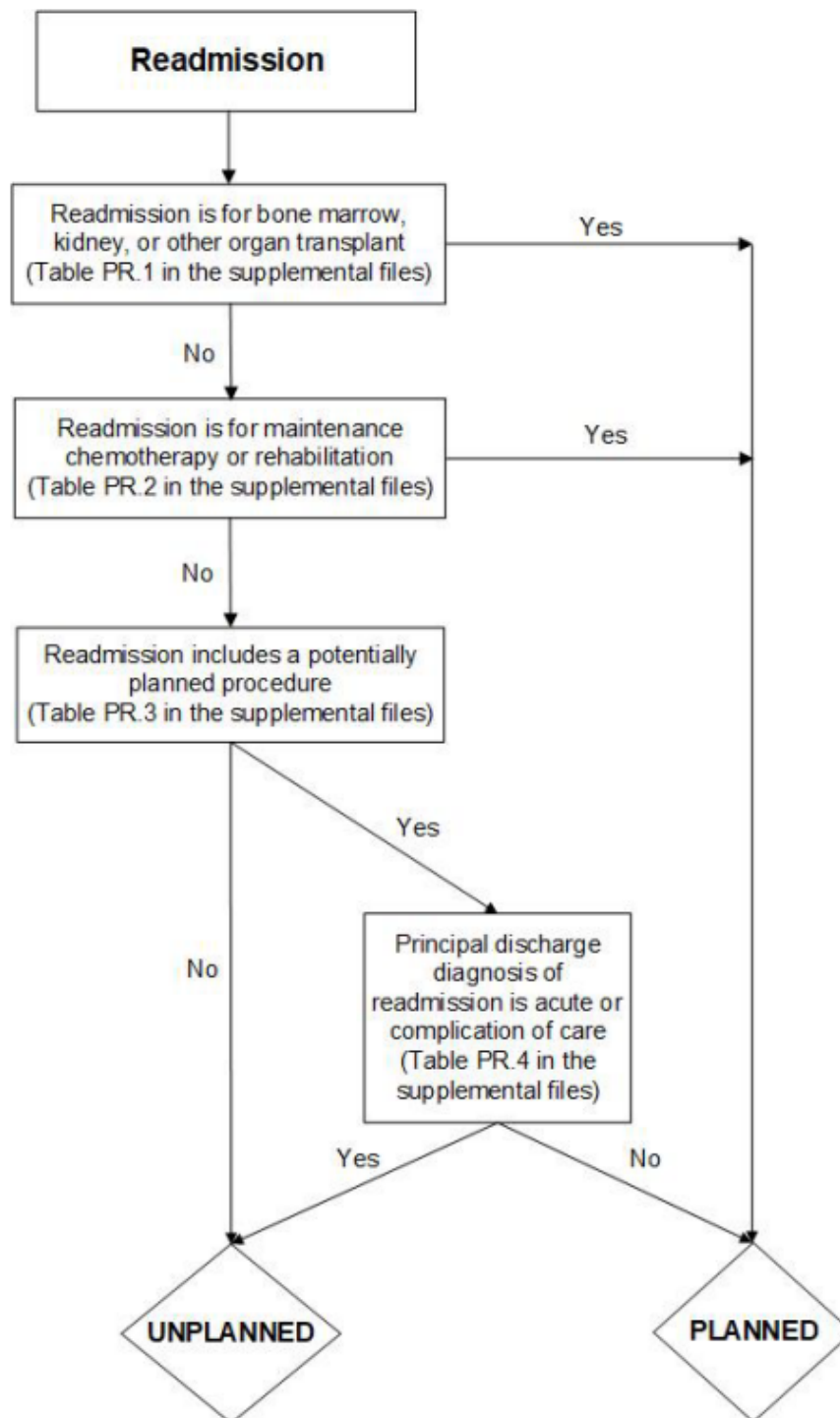


Figure 2. AMI EDAC: Index Cohort (January 1, 2022 – December 31, 2023)

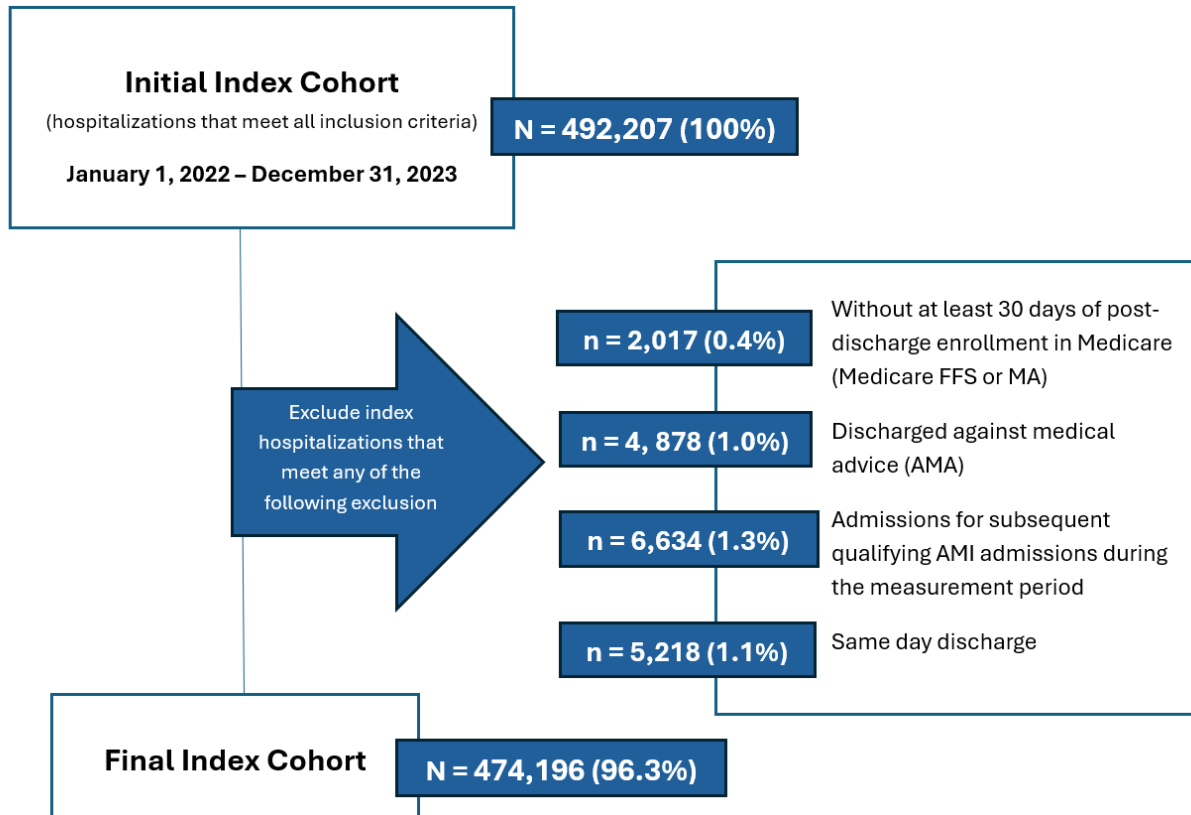


Table 1. AMI EDAC: Hospital Distribution of Risk-Adjusted Measure Scores per 100 Discharges January 1, 2022 - December 31, 2023 (N= 3,623)

Category	January 1, 2021- December 31, 2023
Number of Hospitals	3,623
Mean (SD)	7.2 (52.0)
Range (Min. – Max.)	-172.1 to 709.3
10th Percentile	-37.7
25th Percentile	-19.3
50th Percentile	-1.3
75th Percentile	22.1
90th Percentile	58.1

Figure 3. AMI EDAC: Histogram Displaying Hospital Distribution of Risk-Adjusted Measure Scores per 100 Discharges, January 1, 2022 - December 31, 2023 (N= 3,623)

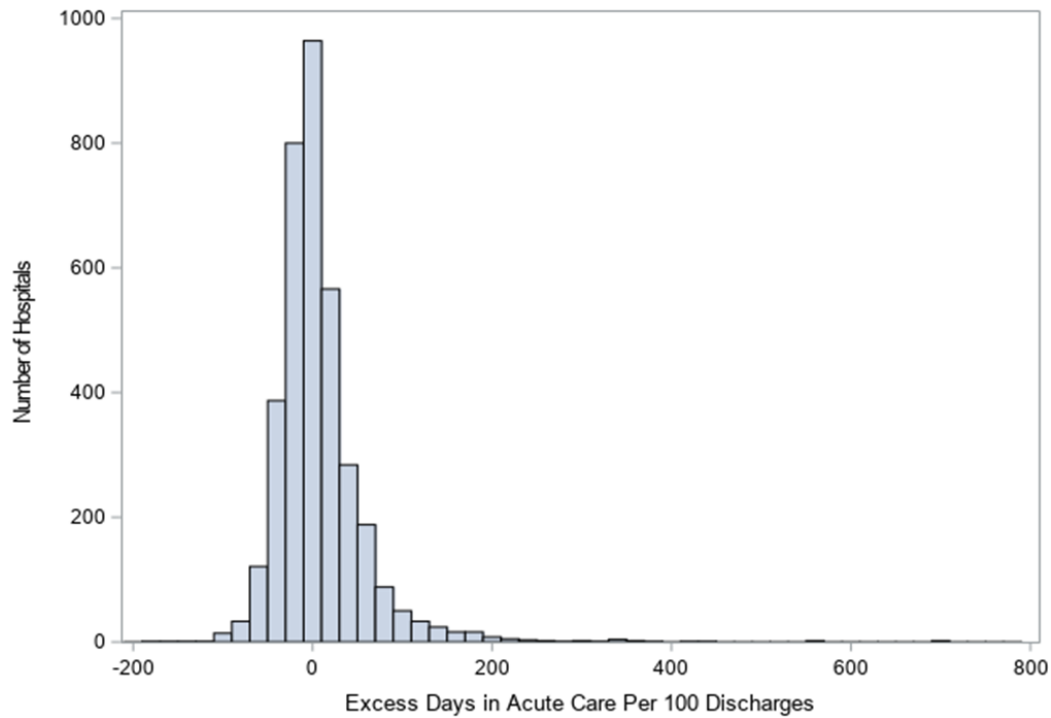


Table 2. AMI EDAC: Performance Scores by Decile (CY2022/2023 Data)

	Overall	Min	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10	Max
Mean Performance Score	7.2	-172.1	-54.6	-30.8	-19.5	-11.8	-5.1	2.2	11.2	22.5	42.8	115.3	709.3
N of Entities	3,623	1	362	362	363	362	362	363	362	363	362	362	1
N of Persons / Encounters / Episodes	474,196	1	9,573	29,479	41,181	52,014	59,782	75,281	81,446	64,348	46,916	14,176	1

Table 3. AMI EDAC: Dataset Descriptions

Dataset	Type of Testing	Description of Dataset
Original Measure Development: 3-year Medicare FFS dataset (July 1, 2010 – June 30, 2013)	Original measure development Cohort definition Face validity	Dates of Data: July 1, 2010 – June 30, 2013 Total number of admissions: 496,716 Total number of hospitals (with at least 1 admission): 4,176
CY2022: 1-year Medicare FFS and Medicare Advantage dataset (January 1, 2022-December 31, 2022)	Risk variable selection	Dates of Data: January 1, 2022-December 31, 2022 Total number of hospitals (with at least 1 admission): 3,352 Total number of admissions: 235,048 Total number of hospitals with at least 50 admissions: 1,741 (48.1% of total) Number of patients within facilities with at least 50 admissions: 225,856 (96.1%)
CY2022/CY2023: 2-year Medicare FFS and Medicare Advantage dataset (January 1, 2022-December 31, 2023)	Reliability Empirical validity Measure score distribution Risk variable prevalence and odds ratios Model performance (discrimination and calibration) Social risk factor testing	Dates of Data: January 1, 2022-December 31, 2023 Total number of hospitals (with at least 1 admission): 3,623 Total number of admissions: 474,196 Male (n= 263,992), 55.7% Female (n= 210,204), 44.3% Dually eligible (DE) (n= 61,864), 13.1%

Dataset	Type of Testing	Description of Dataset
		<p>High ADI (n= 72,507), 15.3%</p> <p>Total number of hospitals with at least 50 admissions: 1,741 (48.1% of total)</p> <p>Number of patients within facilities with at least 50 admissions: 456,946 (96.4%)</p>

Table 4. AMI EDAC: List of Technical Expert Panel (TEP) Members

Name, Credentials, and Professional Role	Organizational Affiliation, City, State
Kevin E. Driesen , PhD, MPH, MA; <i>Assistant Professor & Director of the Arizona Rural Hospital Flexibility Program</i>	<ul style="list-style-type: none"> Center for Rural Health, Mel and Enid Zuckerman College of Public Health, University of Arizona, Tucson, AZ
David Engler , PhD; <i>Senior Vice President for Leadership and Innovation</i>	<ul style="list-style-type: none"> America's Essential Hospitals, Washington, DC
Timothy Farrell , MD; <i>Assistant Professor of Medicine, Geriatrics; Adjunct Professor of Family Medicine</i>	<ul style="list-style-type: none"> University of Utah School of Medicine, Salt Lake City, UT
Karen Farris , PhD; <i>Charles R. Walgreen III Professor of Pharmacy Administration; Director of the Social and Administrative Pharmacy Graduate Program</i>	<ul style="list-style-type: none"> University of Michigan College of Pharmacy, Ann Arbor, MI
Maura C. Feldman , MSW; <i>Director for Hospital Performance Measurement and Improvement</i>	<ul style="list-style-type: none"> Blue Cross Blue Shield of Massachusetts, Inc., Boston, MA
Jay A. Gold , MD, JD, MPH; <i>Vice President & Chief Medical Officer</i>	<ul style="list-style-type: none"> MetaStar, Inc., Madison, WI
Sally Hinkle , DNP, MPA, RN; <i>Director of Performance Improvement & Clinical Value</i>	<ul style="list-style-type: none"> Temple University Hospital, Philadelphia, PA
Amy J.H. Kind , MD, PhD; <i>Assistant Professor of Geriatrics</i>	<ul style="list-style-type: none"> University of Wisconsin School of Medicine and Public Health, Madison, WI
Marjorie King , MD, FACC, MAACVPR; <i>Director of Cardiac Services</i>	<ul style="list-style-type: none"> Helen Hayes Hospital, West Haverstraw, NY

Name, Credentials, and Professional Role	Organizational Affiliation, City, State
Eugene Kroch , PhD; <i>Adjunct Faculty; Vice President & Chief Scientist</i>	<ul style="list-style-type: none"> University of Pennsylvania; Premier, Inc., Philadelphia, PA
Keith D. Lind , JD, MS, BSN; <i>Senior Policy Advisor</i>	<ul style="list-style-type: none"> American Association of Retired Persons (AARP) Public Policy Institute, Washington, DC
Michael A. Ross , MD, FACEP; <i>Medical Director of Observation Medicine and Chest Pain Center; Professor of Emergency Medicine</i>	<ul style="list-style-type: none"> Emory University School of Medicine, Atlanta, GA
Mark Louis Sanz , MD; <i>Interventional Cardiologist</i>	<ul style="list-style-type: none"> International Heart Institute of Montana, Missoula, MT
Paul Takahashi , MD; <i>Associate Professor of Medicine</i>	<ul style="list-style-type: none"> Mayo Clinic College of Medicine, Rochester, MN
Patient Representative	<ul style="list-style-type: none">
Patient Representative	<ul style="list-style-type: none">

Table 5. AMI EDAC: Technical Expert Panel (TEP) Face Validity Voting Results

Response Category	Number	Frequency
Strongly agree	4	33.3%
Moderately agree	6	50.0%
Somewhat agree	1	8.3%
Somewhat disagree	0	0.0%
Moderately disagree	1	8.3%
Strongly disagree	0	0.0%

Table 6. AMI EDAC: Construct Validity Testing

Comparison Measures	Number of Hospitals	Pearson Correlation Coefficient	P-value
Star Rating Standardized Readmission Group Scores	1,704	-0.335	<0.001
Star Rating Standardized Readmission Group Scores Excluding Hospital-Wide Readmission and the [FFS-only] AMI EDAC Measure	1,684	-0.252	<0.001
Star Rating Standardized Summary Score	1,704	-0.248	<0.001
Star Rating Standardized Summary Score Excluding Readmission Group Score	1,704	-0.122	<0.001
Star Ratings Standardized Patient Experience Group Score	1,698	-0.173	<0.001
Medicare Spending Per Beneficiary	1,670	0.117	<0.001

Figure 4. AMI EDAC: Daily Readmission Rate (CY2022/2023 Data) (Time to First Readmission after Discharge)

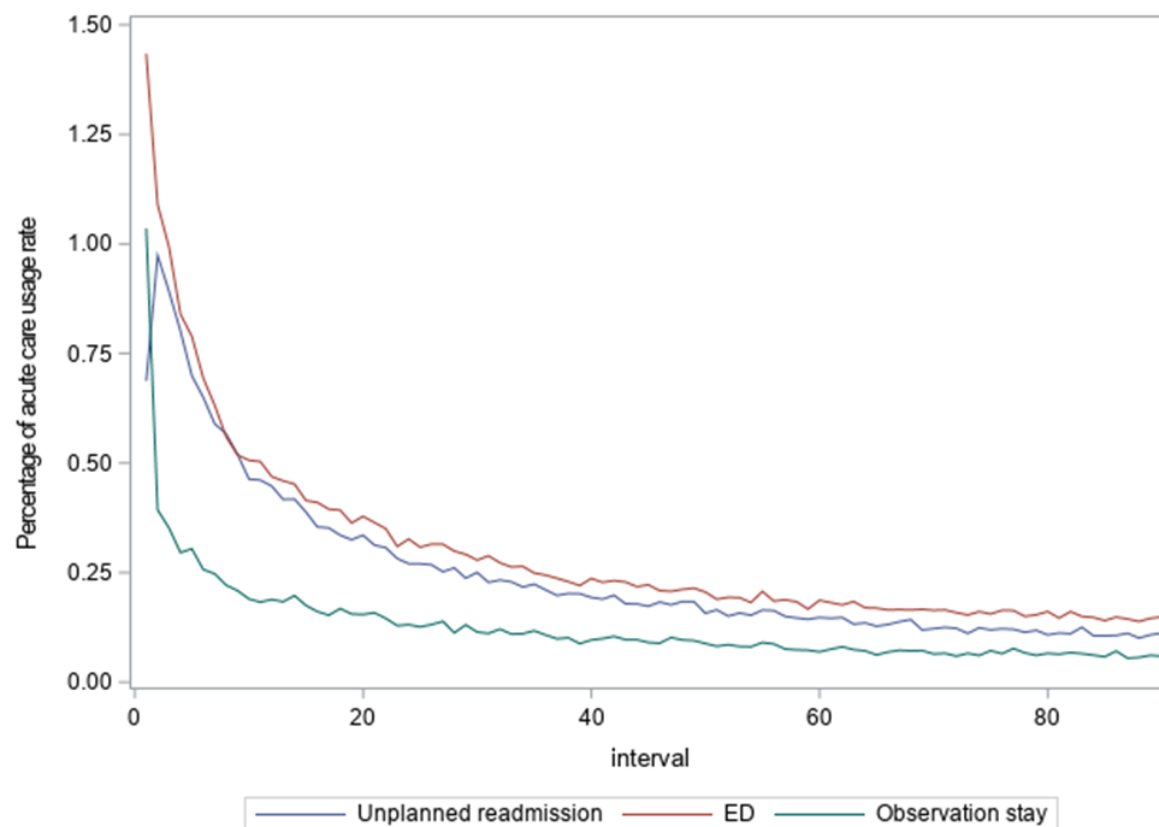


Table 7. AMI EDAC: Top 20 (Most Frequent) CCS Categories Associated with an Unplanned Readmission

Rank	CCS Category	CCS Label	Number	Percent	Cumulative Count	Cumulative Percent
1	99	Hypertension with complications and secondary hypertension	11,882	19.38	11,882	19.38
2	100	Acute myocardial infarction	8,022	13.09	19,904	32.47
3	2	Septicemia (except in labor)	4,639	7.57	24,543	40.04
4	101	Coronary atherosclerosis and other heart disease	3,442	5.61	27,985	45.65
5	106	Cardiac dysrhythmias	2,545	4.15	30,530	49.80
6	153	Gastrointestinal hemorrhage	2,352	3.84	32,882	53.64
7	238	Complications of surgical procedures or medical care	2,065	3.37	34,947	57.01
8	237	Complication of device; implant or graft	2,004	3.27	36,951	60.28
9	157	Acute and unspecified renal failure	1,894	3.09	38,845	63.37
10	109	Acute cerebrovascular disease	1,468	2.39	40,313	65.76
11	122	Pneumonia (except that caused by tuberculosis or sexually transmitted disease)	1,449	2.36	41,762	68.13
12	131	Respiratory failure; insufficiency; arrest (adult)	1,072	1.75	42,834	69.87
13	102	Nonspecific chest pain	972	1.59	43,806	71.46
14	55	Fluid and electrolyte disorders	896	1.46	44,702	72.92
15	50	Diabetes mellitus with complications	875	1.43	45,577	74.35
16	159	Urinary tract infections	870	1.42	46,447	75.77
17	108	Congestive heart failure; nonhypertensive	695	1.13	47,142	76.90
18	103	Pulmonary heart disease	647	1.06	47,789	77.96
19	117	Other circulatory disease	645	1.05	48,434	79.01
20	127	Chronic obstructive pulmonary disease and bronchiectasis	587	0.96	49,021	79.97
21	146	Diverticulosis and diverticulitis	519	0.85	49,540	80.81
22	95	Other nervous system disorders	444	0.72	49,984	81.54
23	149	Biliary tract disease	402	0.66	50,386	82.19

Rank	CCS Category	CCS Label	Number	Percent	Cumulative Count	Cumulative Percent
24	155	Other gastrointestinal disorders	393	0.64	50,779	82.84
25	59	Deficiency and other anemia	375	0.61	51,154	83.45

Table 8. AMI EDAC: Frequency of ICD-10-Based Risk Variables and Adjusted OR with 95% Confidence Intervals (January 1, 2022-December 31, 2023)

Variable	Description	Percentage (%) (N=474,196)	OR (95% CI)
AGE	Age, mean (SD)	76.86 (7.69)	1.00 (1.00-1.00)
ICD-10 codes during the index admission			
IND_D631	Anemia in chronic kidney disease	6.58	1.26 (1.25-1.27)
IND_D638	Anemia in other chronic diseases classified elsewhere	1.82	1.25 (1.23-1.27)
IND_D649	Anemia, unspecified	7.86	1.21(1.20-1.22)
IND_D72829	Elevated white blood cell count, unspecified	4.49	1.06 (1.05-1.08)
IND_E43	Unspecified severe protein-calorie malnutrition	1.59	1.22 (1.19-1.24)
IND_E782	Mixed hyperlipidemia	9.06	0.92 (0.91-0.93)
IND_E785	Hyperlipidemia, unspecified	58.5	0.93 (0.92-0.93)
IND_E871	Hypo-osmolality and hyponatremia	6.97	1.28 (1.27-1.29)
IND_G250	Essential tremor	0.53	0.90 (0.87-0.94)
IND_G40909	Epilepsy, unspecified, not intractable, without status epilepticus	1.37	1.24 (1.21-1.26)
IND_I10	Essential (primary) hypertension	35.7	0.80 (0.79-0.80)
IND_I120	Hypertensive chronic kidney disease with stage 5 chronic kidney disease or end stage renal disease	1.07	1.29 (1.26-1.31)
IND_I313	Pericardial effusion (noninflammatory)	0.37	1.43 (1.38-1.48)
IND_I429	Cardiomyopathy, unspecified	3.71	1.06 (1.05-1.07)
IND_I4891	Unspecified atrial fibrillation	6.32	1.12 (1.11-1.13)
IND_I5021	Acute systolic (congestive) heart failure	5.55	1.18 (1.16-1.19)
IND_I5023	Acute on chronic systolic (congestive) heart failure	6.33	1.24 (1.23-1.26)
IND_I5033	Acute on chronic diastolic (congestive) heart failure	4.01	1.19 (1.18-1.20)
IND_I5043	Acute on chronic combined systolic (congestive) and	3.61	1.22 (1.21-1.24)

Variable	Description	Percentage (%) (N=474,196)	OR (95% CI)
	diastolic (congestive) heart failure		
IND_I513	Intracardiac thrombosis, not elsewhere classified	0.54	1.22 (1.18-1.26)
IND_I5181	Takotsubo syndrome	1.56	0.79 (0.77-0.81)
IND_I739	Peripheral vascular disease, unspecified	4.49	1.08 (1.07-1.09)
IND_N170	Acute kidney failure with tubular necrosis	1.44	1.45 (1.42-1.48)
IND_N179	Acute kidney failure, unspecified	17.09	1.14 (1.13-1.15)
IND_R338	Other retention of urine	0.82	1.33 (1.29-1.36)
IND_R54	Age-related physical debility	0.80	1.15 (1.12-1.19)
IND_R7303	Prediabetes	3.05	0.81 (0.79-0.82)
IND_Z515	Encounter for palliative care	3.08	0.81(0.80-0.83)
IND_Z66	Do not resuscitate	9.10	0.93 (0.93-0.95)
ICD-10 codes in the 12 months prior to admission			
PRE_D509	Iron deficiency anemia, unspecified	9.13	1.21 (1.20-1.22)
PRE_D649	Anemia, unspecified	18.35	1.18(1.18-1.19)
PRE_F17210	Nicotine dependence, cigarettes, uncomplicated	9.24	1.23 (1.21-1.24)
PRE_I10	Essential (primary) hypertension	77.82	1.13 (1.12-1.14)
PRE_I160	Hypertensive urgency	4.63	1.21 (1.2-1.23)
PRE_I2111	ST elevation (STEMI) myocardial infarction involving right coronary artery	4.77	0.90 (0.88-0.91)
PRE_I213	ST elevation (STEMI) myocardial infarction of unspecified site	18.03	1.02 (1.01-1.03)
PRE_J90	Pleural effusion, not elsewhere classified	12.02	1.23 (1.22-1.24)
PRE_Z888	Allergy status to other drugs, medicaments and biological substances	7.26	1.20 (1.19-1.21)
ICD-10 codes either during the index admission or 12 months prior to admission			
E1122	Type 2 diabetes mellitus with diabetic chronic kidney disease	23.91	1.19 (1.18-1.20)
I130	Hypertensive heart and chronic kidney disease with heart	20.35	1.10 (1.10-1.11)

Variable	Description	Percentage (%) (N=474,196)	OR (95% CI)
	failure and stage 1 through stage 4 chronic kidney disease, or unspecified chronic kidney disease		
I350	Nonrheumatic aortic (valve) stenosis	9.35	1.12 (1.11-1.13)
I480	Paroxysmal atrial fibrillation	18.36	1.17 (1.16-1.18)
J441	Chronic obstructive pulmonary disease with (acute) exacerbation	7.30	1.26 (1.25-1.27)
Other risk variables			
MA	MA (versus FFS)	52.23	1.32 (1.31-1.33)
MCCFI	Multiple Chronic Conditions Frailty Index	68.12	1.03 (1.03-1.04)
AMI_ANT	Anterior myocardial infarction	7.50	1.20 (1.18-1.21)
AMI_OTH	Non-anterior location of myocardial infarction	14.27	1.05 (1.04-1.06)
HXPTCA	History of PTCA	27.75	1.02 (1.02-1.03)
HXCABG	History of CABG	15.27	1.00 (1.00-1.01)

Table 9. AMI EDAC: AMI EDAC: Hospital-Level Prevalence of Social Risk Factors, January 1, 2022 - December 31, 2023 (N= 474,196)

Social Risk Factor	Median Hospital Proportion (%)
Dual Eligibility (DE)	10.5 (3.7 – 22.3)
High Area Deprivation Index (ADI) (≥ 85)	8.3 (0.0 – 30.8)

Table 10. AMI EDAC: Mean Unadjusted Days in Acute Care for Admissions with and without Social Risk Factors

Social Risk Factor	Number of patients	Mean Unadjusted Days in Acute Care (SD)
Dual Eligibility (DE)	61,864	169 (377)
Non-DE	412,332	111 (295)
High Area Deprivation Index (ADI) (≥ 85)	72,507	134 (332)
Low ADI (< 85)	384,679	116 (302)

Figure 5. AMI EDAC: Calibration Plot for Patients (A) with the Dual Eligibility (DE) Variable and (B) without the DE Variable (CY2022 Data)

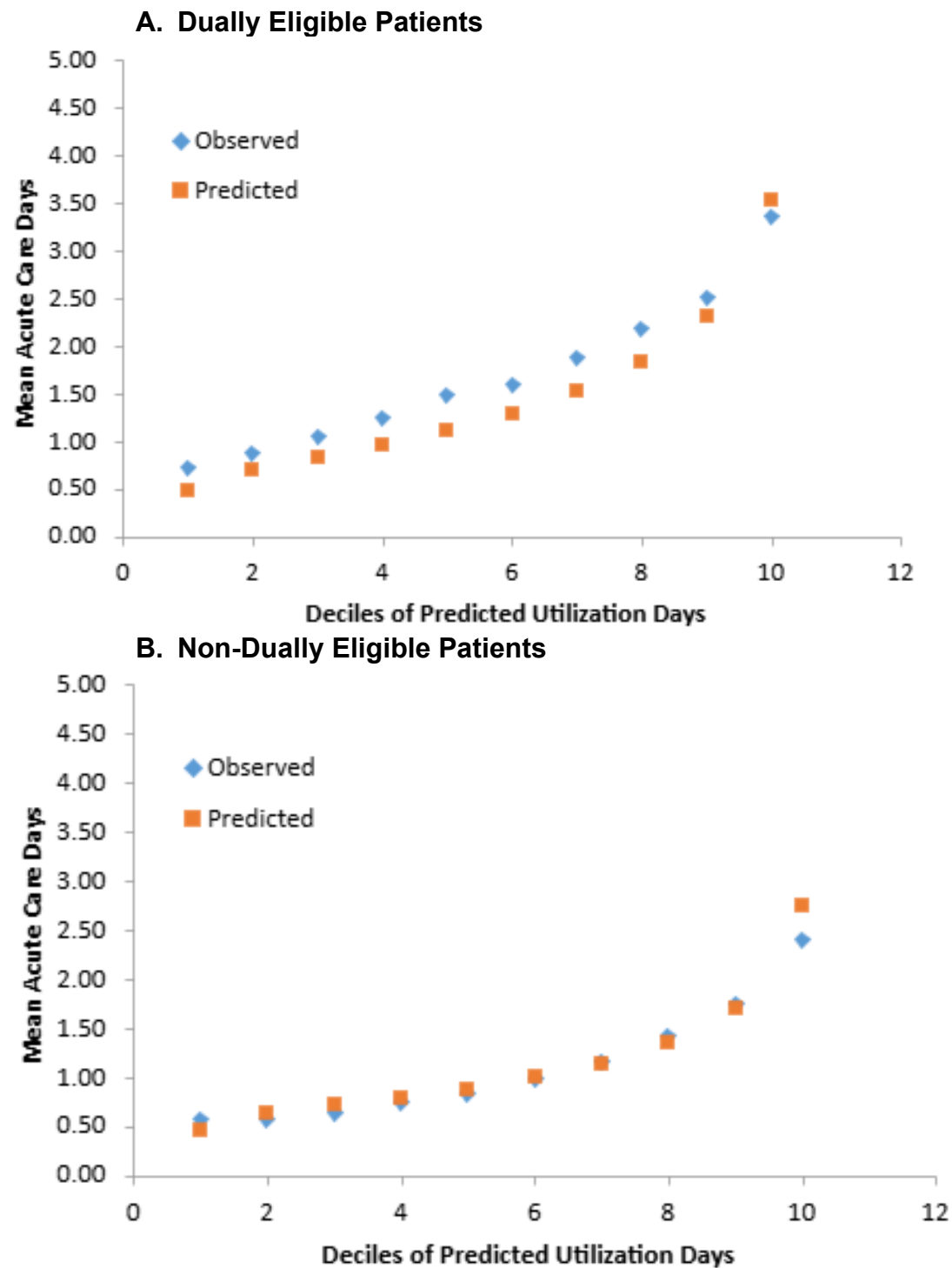


Figure 6. AMI EDAC: Calibration Plot for Patients (A) with the High Area Deprivation Index (ADI) Variable and (B) without the High ADI Variable (CY2022 Data)

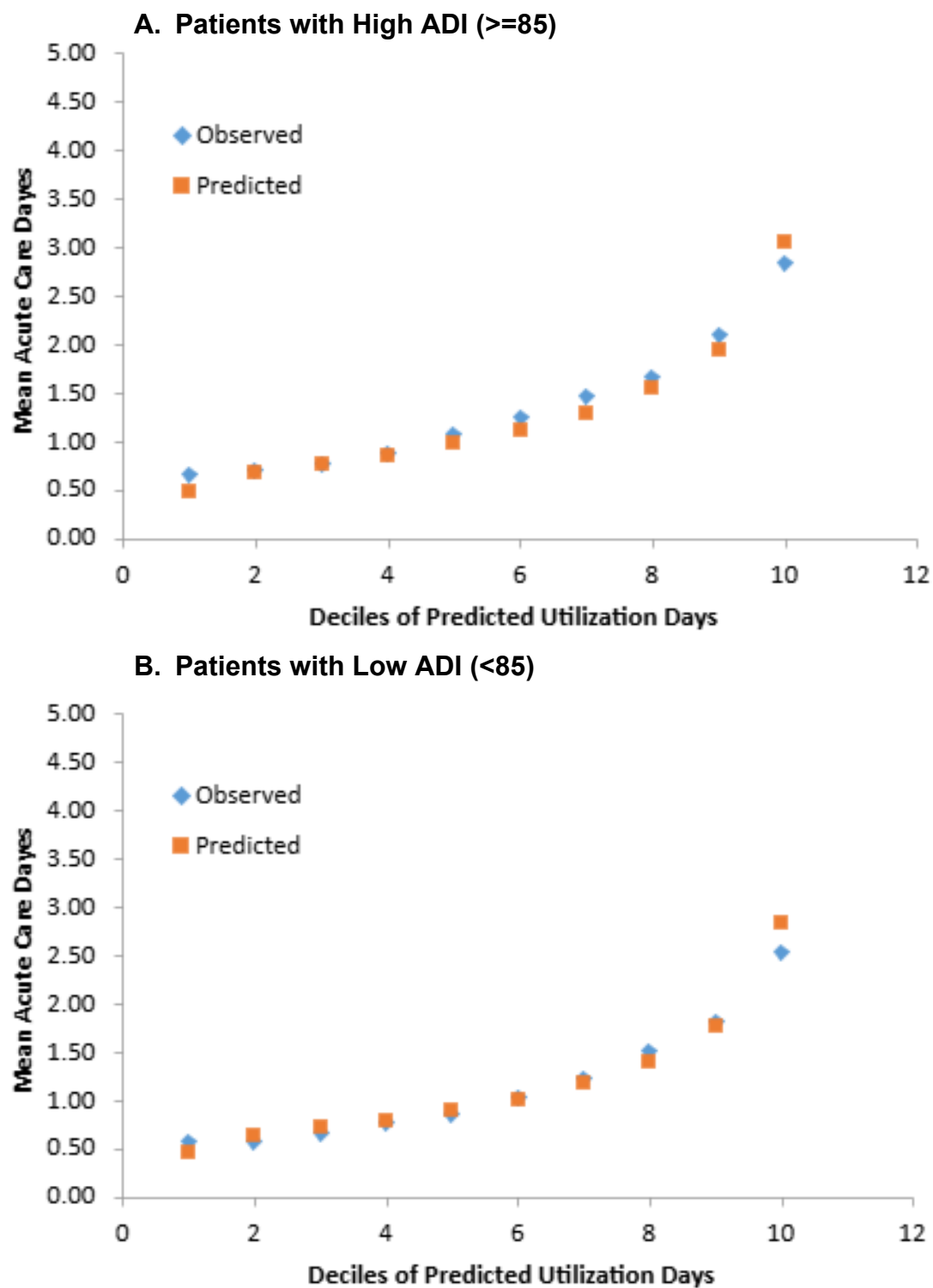


Table 11. AMI EDAC Measure Scores and Correlation Between Measure Scores, for Measure Scores Calculated with and without Social Risk Factors (Dual Eligibility [DE] and High Area Deprivation Index [ADI]) (CY2022/CY2023 Data) (N=3,623 Hospitals)

Social Risk Factor	Median Difference in Measure Scores (%)	IQR (25th Percentile-75th Percentile)	Pearson Correlation Coefficient	p-value
DE	0.60	-1.14 to 1.68	0.998	<.0001
High ADI (>=85)	0.33	-0.54 to 0.98	>0.999	<.0001

Figure 7. AMI EDAC: Measure Scores and Correlation Between Measure Scores, for Measure Scores Calculated with and without Dual Eligibility [DE] (CY2022/2023 Data) (N=3,623 Hospitals)

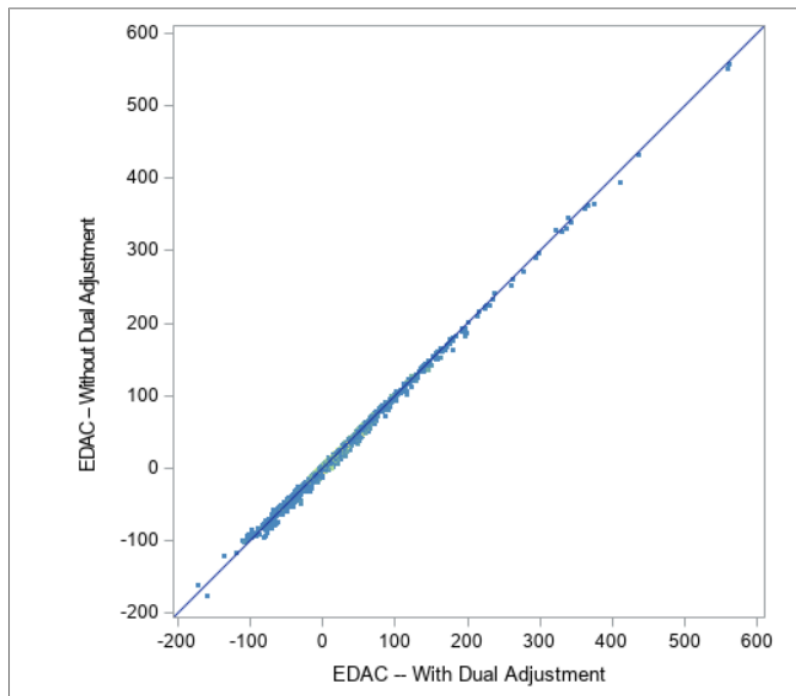


Figure 8. AMI EDAC: Measure Scores and Correlation Between Measure Scores, for Measure Scores Calculated with and without High ADI (CY2022/2023 Data) (N=3,623 Hospitals)

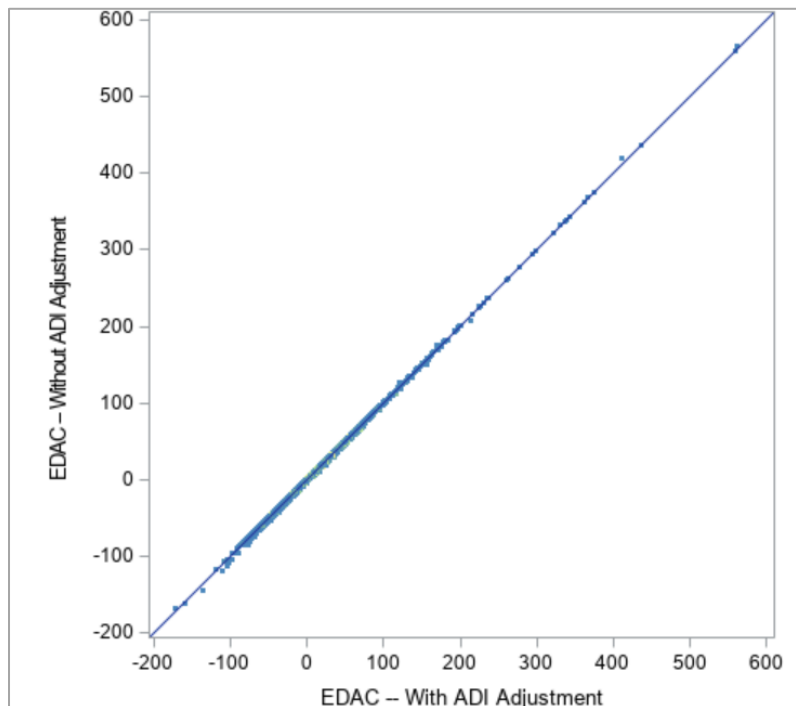


Figure 9. AMI EDAC: Measure Scores Stratified by the Hospital-proportion of Patients with Dual Eligibility (CY2022/2023 Data) (N=3,623 Hospitals)

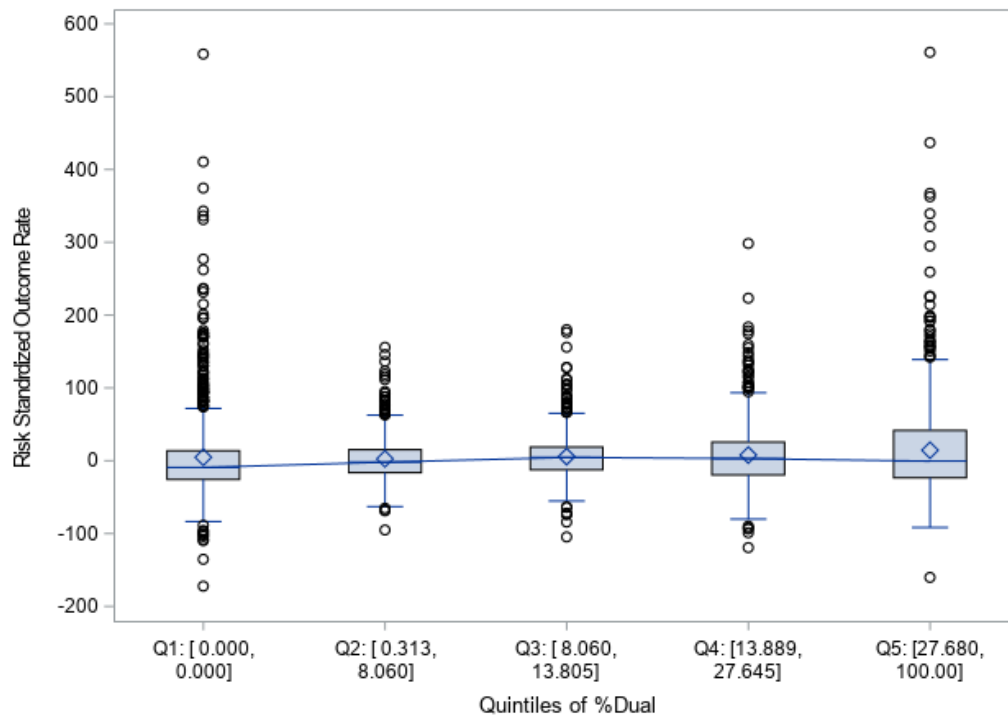


Figure 10. AMI EDAC: Measure Scores Stratified by the Hospital-proportion of Patients with High ADI (CY2022/2023 Data) (N=3,623 Hospitals)

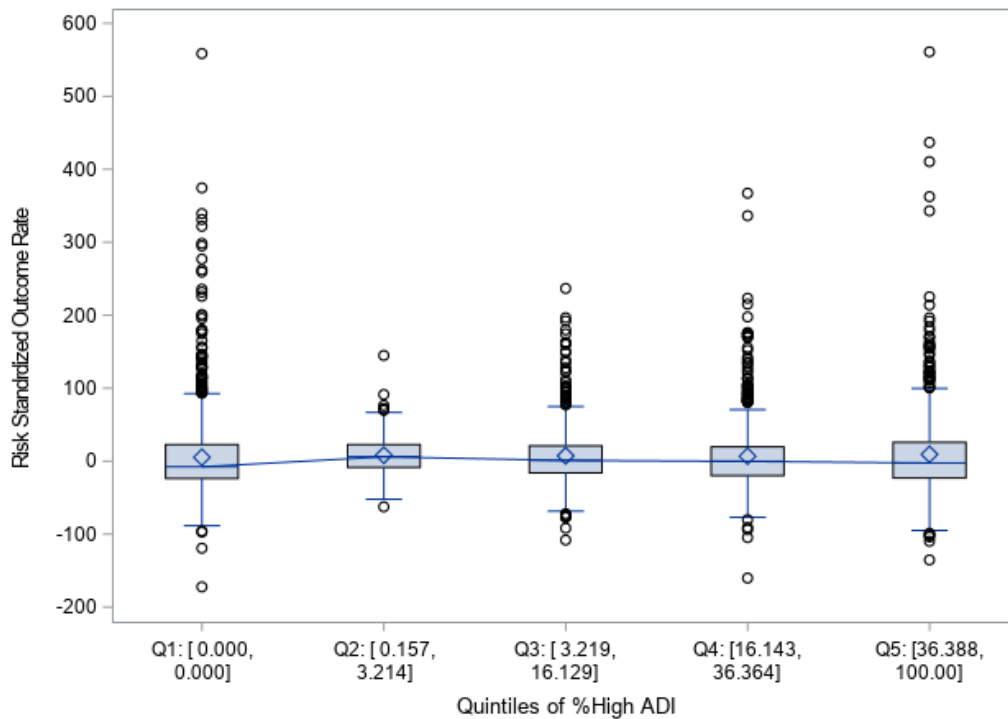


Table 12. AMI EDAC Model Testing: C-statistic, Predictive Ability, Overfitting (CY2022/2023 Data)

Sample	C-Statistic	Predictive Ability %	Overfitting (γ_0, γ_1)
Derivation (n=237,490)	0.659	0.58-2.58	0.000, 1.000
Validation (n=236,706)	0.659	0.59-2.61	-0.007, 0.997

Figure 11. AMI EDAC: Model Testing Calibration Plot (CY2022/2023 Data)

