

Supplementary Online Content 09/14/19

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Appendix Table 1. Sample Selection and Study Exclusions

We scanned all index admissions from July 1, 2012 through November 30, 2014 for a relevant ICD-9 principal diagnosis codes for AMI, HF, or Pneumonia.

Exclusion Step	Admissions (N)	Remaining Admissions after Step (N)	Percent Remaining
All index admissions with a qualifying principal diagnosis or procedure	3,382,751	--	100.0%
Excluded due to missing DOB or sex	0	3,382,751	100.0%
Excluded due to age below 65.5	544,980	2,837,771	83.9%
Excluded due to invalid admission date	50,576	2,787,195	82.4%
Excluded due to outside of 50 states and DC	189,933	2,597,262	76.8%
Excluded admissions to hospitals not participating in Medicare IPPS	2,419	2,594,843	76.7%
Excluded due to hospice--index claim indicator	285	2,594,558	76.7%
Excluded admissions to hospitals without valid HCRIS data	17,525	2,577,033	76.2%
Excluded due to admission from hospice, or evidence of hospice care in the past six months	32,685	2,544,348	75.2%
Excluded due to missing MBSF file	136	2,544,212	75.2%
Excluded due to HMO enrollment or incomplete Part B enrollment in the 6 months prior to admission or palliative care in the past six months	157,376	2,386,836	70.6%
Final hospital assignment had invalid or no HCRIS data and was not an ineligible hospital	11,125	2,375,711	70.2%
Index admissions after all rounds of exclusions		2,375,711	70.2%

Following these exclusions, we selected a random admission for each patient during the study period.

Exclusion Step	AMI	HF	PNA	Total
All qualifying admissions	472,949	991,325	911,354	2,375,628
One medical admission per patient	387,642	620,505	725,081	1,733,228
Ninety percent sample selection	348,875	558,455	652,573	1,559,903

Appendix Table 2. ICD-9 Principal Diagnoses for Medical Conditions

Principal Diagnosis Category	ICD9	ICD9 Label
AMI		
Anterior STEMI	410.00	Acute myocardial infarction of anterolateral wall, episode of care unspecified
	410.01	Acute myocardial infarction of anterolateral wall, initial episode of care
	410.10	Acute myocardial infarction of other anterior wall, episode of care unspecified
	410.11	Acute myocardial infarction of other anterior wall, initial episode of care
Other Location STEMI	410.20	Acute myocardial infarction of inferolateral wall, episode of care unspecified
	410.21	Acute myocardial infarction of inferolateral wall, initial episode of care
	410.30	Acute myocardial infarction of inferoposterior wall, episode of care unspecified
	410.31	Acute myocardial infarction of inferoposterior wall, initial episode of care
	410.40	Acute myocardial infarction of other inferior wall, episode of care unspecified
	410.41	Acute myocardial infarction of other inferior wall, initial episode of care
	410.50	Acute myocardial infarction of other lateral wall, episode of care unspecified
	410.51	Acute myocardial infarction of other lateral wall, initial episode of care
	410.60	True posterior wall infarction, episode of care unspecified
	410.61	True posterior wall infarction, initial episode of care
NSTEMI or Unspecified MI	410.70	Subendocardial infarction, episode of care unspecified
	410.71	Subendocardial infarction, initial episode of care
	410.80	Acute myocardial infarction of other specified sites, episode of care unspecified
	410.81	Acute myocardial infarction of other specified sites, initial episode of care
	410.90	Acute myocardial infarction of unspecified site, episode of care unspecified
	410.91	Acute myocardial infarction of unspecified site, initial episode of care
HF		
HF with Chronic Kidney Disease	404.01	Hypertensive heart and chronic kidney disease, malignant, with heart failure and with chronic kidney disease stage I through stage IV, or unspecified
	404.03	Hypertensive heart and chronic kidney disease, malignant, with heart failure and with chronic kidney disease stage V or end stage renal disease
	404.11	Hypertensive heart and chronic kidney disease, benign, with heart failure and with chronic kidney disease stage I through stage IV, or unspecified
	404.13	Hypertensive heart and chronic kidney disease, benign, with heart failure and chronic kidney disease stage V or end stage renal disease
	404.91	Hypertensive heart and chronic kidney disease, unspecified, with heart failure and with chronic kidney disease stage I through stage IV, or unspecified
	404.93	Hypertensive heart and chronic kidney disease, unspecified, with heart failure and chronic kidney disease stage V or end stage renal disease
HF with Hypertension	402.01	Malignant hypertensive heart disease with heart failure
	402.11	Benign hypertensive heart disease with heart failure
	402.91	Unspecified hypertensive heart disease with heart failure
HF, Other	428.0	Congestive heart failure, unspecified
	428.1	Left heart failure
	428.2	Systolic heart failure
	428.20	Systolic heart failure, unspecified
	428.21	Acute systolic heart failure
	428.22	Chronic systolic heart failure
	428.23	Acute on chronic systolic heart failure
	428.3	Diastolic heart failure
	428.30	Diastolic heart failure, unspecified
	428.31	Acute diastolic heart failure
	428.32	Chronic diastolic heart failure
	428.33	Acute on chronic diastolic heart failure
	428.4	Combined systolic and diastolic heart failure
	428.40	Combined systolic and diastolic heart failure, unspecified
428.41	Acute combined systolic and diastolic heart failure	

Principal Diagnosis Category	ICD9	ICD9 Label
	428.42	Chronic combined systolic and diastolic heart failure
	428.43	Acute on chronic combined systolic and diastolic heart failure
	428.9	Heart failure, unspecified
Pneumonia		
Aspiration Pneumonia	507.0	Pneumonitis due to inhalation of food or vomitus
Legionnaire's Disease	482.84	Pneumonia due to legionnaires' disease
Pneumococcal Pneumonia	481	Pneumococcal pneumonia (streptococcus pneumoniae pneumonia)
Pneumonia Due to Anaerobes or Gram-Negative Bacteria	482 482.0 482.81 482.82 482.83	Pneumonia due to klebsiella pneumoniae Pneumonia due to klebsiella pneumoniae Pneumonia due to anaerobes Pneumonia due to escherichia coli (e.coli) Pneumonia due to other gram-negative bacteria
Pneumonia Due to MRSA	482.41 482.42	Pneumonia due to staphylococcus aureus Methicillin resistant pneumonia due to Staphylococcus aureus
Pneumonia Due to Pseudomonas	482.1	Pneumonia due to pseudomonas
Pneumonia, Other	483 485 486 482.9 483.0 483.1 483.8 482.89	Pneumonia due to mycoplasma pneumoniae Bronchopneumonia organism unspecified Pneumonia organism unspecified Bacterial pneumonia unspecified Pneumonia due to mycoplasma pneumoniae Pneumonia due to chlamydia Pneumonia due to other specified organism Pneumonia due to other specified bacteria
Pneumonia Due to H. Influenza	482.2	Pneumonia due to hemophilus influenzae (h. influenzae)
Staphylococcal Pneumonia	482.4 482.40 482.49	Pneumonia due to staphylococcus unspecified Pneumonia due to staphylococcus unspecified Other staphylococcus pneumonia
Streptococcal Pneumonia	482.3 482.30 482.31 482.32 482.39	Pneumonia due to streptococcus unspecified Pneumonia due to streptococcus unspecified Pneumonia due to streptococcus group a Pneumonia due to streptococcus group b Pneumonia due to other streptococcus
Viral Pneumonia	480 487 480.0 480.1 480.2 480.3 480.8 480.9 487.0 488.11	Viral Pneumonia Influenza with pneumonia Pneumonia due to adenovirus Pneumonia due to respiratory syncytial virus Pneumonia due to parainfluenza virus Pneumonia due to SARS-associated coronavirus Viral pneumonia: pneumonia due to other virus not elsewhere classified Viral pneumonia unspecified Influenza with pneumonia Influenza due to identified novel H1N1 influenza virus with pneumonia

Appendix Table 3. Characteristics of Randomly Split 90% Matching and 10% Risk Model Samples

Covariate (% unless noted)	90% Sample	10% Sample
N Patients	1,159,903	173,325
Age (years, mean)	80.17	80.09
Age 65-69	13.47	13.70
Age 70-74	16.01	16.08
Age 75-79	17.32	17.39
Age 80-84	19.19	19.14
Age 85+	34.01	33.69
Sex (male)	47.47	47.52
Race- White	83.30	83.44
Race- Black	8.84	8.77
Race- Hispanic	4.80	4.71
Race- Other	3.06	3.08
Emergent Type Admission	78.37	78.52
Treatment at another hospital's ED	0.09	0.08
Prior Dialysis Visit	0.69	0.67
Region* Northeast	26.47	26.43
Region* Midwest	24.26	24.31
Region* Pacific	9.66	9.57
Region* South	35.14	35.15
Region* Rockies	4.47	4.54
Principal Diagnoses		
AMI	22.37	22.37
HF	35.80	35.80
PNA	41.83	41.83
Comorbidities		
Heart Failure	40.63	40.55
Myocardial Infarction	4.89	4.96
Unstable Angina	6.87	6.86
Cardio-respiratory Failure or Shock	16.45	16.49
Valvular Heart Disease	34.58	34.61
Hypertension	89.29	89.30
Stroke	8.07	8.06
Cerebrovascular Disease	17.92	17.92
Renal Failure	29.30	29.13
COPD	53.90	53.75
Pneumonia; pleural effusion/pneumothorax	9.65	9.66
Diabetes	45.80	45.83
Malnutrition	10.08	9.96
Dementia or other specified brain disorders	26.95	26.71
Hemiplegia, paraplegia, paralysis, functional disability	7.77	7.70
Vascular disease and complications	29.27	29.11
Cancer	6.19	6.14
Trauma; other injuries	30.21	30.10
Major psychiatric disorders	11.59	11.66
Chronic Liver Disease	2.14	2.11
Severe hematological disorders	1.86	1.87
Iron deficiency or other/unspecified anemias and blood disease	54.47	54.29
Depression	20.14	20.22
Parkinson's and Huntington's diseases	3.45	3.50
Seizure disorders and convulsions	4.74	4.65
Fibrosis of lung or other chronic lung disorders	43.11	43.35
Asthma	8.88	8.88
*Regions: Northeast: CT, DC, DE, MA, MD, ME, NH, NJ, NY, PA, RI, VA, VT; Midwest: IA, IL, IN, KS, KY, MI, MN, MO, NE, ND, OH, SD, WI; South: AL, AR, FL, GA, LA, MS, NC, OK, SC, TN, TX, WV; Rockies: AZ, CO, ID, MT, NM, NV, UT, WY; Pacific: AK, CA, HI, OR, WA s		

Appendix Table 4. AMI Risk Models All AMI risk models are based on a 10% random sample of patients admitted nationwide (N=38,767).

Appendix Table 4a. AMI Risk Model for 30-Day Mortality The risk model for 30-day mortality in AMI was estimated from a 10% random sample of AMI patients treated nationwide (N=38,767), using binary logistic regression (c=0.75).

Variable	Odds Ratio		Chi Sq	P
	Estimate (SE)	(95% CI)		
Intercept	-3.40 (0.08)	0.00 (0.00, 0.00)	1673.4	<.0001
<i>Patient Demographics</i>				
Age 65-69 (reference)	--	--	--	--
Age 70-74	0.14 (0.07)	1.15 (1.00, 1.31)	4.0	0.05
Age 75-79	0.42 (0.07)	1.52 (1.34, 1.73)	40.8	<.0001
Age 80-84	0.78 (0.06)	2.18 (1.93, 2.47)	151.6	<.0001
Age 85+	1.25 (0.06)	3.51 (3.12, 3.94)	438.1	<.0001
Sex (male)	0.11 (0.03)	1.11 (1.04, 1.19)	9.6	<.01
<i>Race- White (reference)</i>				
Race- Black	-0.15 (0.07)	0.86 (0.75, 0.98)	5.0	0.03
Race- Hispanic	-0.06 (0.08)	0.94 (0.80, 1.10)	0.6	0.45
Race- Other	0.19 (0.09)	1.21 (1.02, 1.44)	4.8	0.03
Emergent Type Admission	0.15 (0.04)	1.16 (1.07, 1.25)	12.8	<.001
Treatment at another hospital's ED	-0.68 (0.40)	0.51 (0.23, 1.11)	2.9	0.09
Prior Dialysis Visit	0.68 (0.17)	1.98 (1.42, 2.74)	16.5	<.0001
<i>Principal Diagnoses</i>				
STEMI Type 1	0.90 (0.05)	2.46 (2.21, 2.73)	287.1	<.0001
STEMI Type 2	0.53 (0.05)	1.71 (1.55, 1.88)	113.6	<.0001
NSTEMI or unspecified MI (reference)	--	--	--	--
<i>Comorbidities</i>				
History of PTCA	-0.28 (0.07)	0.76 (0.66, 0.86)	16.7	<.0001
History of CABG	-0.05 (0.06)	0.95 (0.84, 1.07)	0.7	0.40
Heart Failure	0.20 (0.04)	1.22 (1.12, 1.32)	22.8	<.0001
Myocardial Infarction	-0.27 (0.05)	0.76 (0.69, 0.85)	26.1	<.0001
Unstable Angina	-0.18 (0.06)	0.84 (0.75, 0.93)	10.5	<.01
Cardio-respiratory Failure or Shock	0.42 (0.06)	1.52 (1.37, 1.70)	57.2	<.0001
Valvular Heart Disease	0.09 (0.04)	1.10 (1.03, 1.18)	7.1	<.01
Hypertension	-0.32 (0.05)	0.73 (0.66, 0.81)	35.7	<.0001
Stroke	-0.03 (0.07)	0.97 (0.85, 1.11)	0.2	0.66
Cerebrovascular Disease	-0.04 (0.05)	0.96 (0.88, 1.05)	0.8	0.38
Renal Failure	0.10 (0.04)	1.10 (1.02, 1.20)	5.6	0.02
COPD	0.18 (0.04)	1.19 (1.11, 1.29)	22.7	<.0001
Pneumonia; pleural effusion/pneumothorax	0.73 (0.04)	2.07 (1.93, 2.23)	382.0	<.0001
Diabetes	0.13 (0.03)	1.14 (1.07, 1.22)	14.8	<.001
Malnutrition	0.58 (0.06)	1.78 (1.58, 2.00)	95.3	<.0001
Dementia or other specified brain disorders	0.49 (0.04)	1.63 (1.51, 1.77)	146.7	<.0001
Hemiplegia, paraplegia, paralysis, functional disability	0.24 (0.07)	1.27 (1.11, 1.45)	11.8	<.001
Vascular disease and complications	0.09 (0.04)	1.09 (1.01, 1.18)	4.9	0.03
Cancer	0.60 (0.07)	1.82 (1.57, 2.10)	65.7	<.0001
Trauma; other injuries	0.08 (0.04)	1.08 (1.00, 1.16)	4.0	0.04
Major psychiatric disorders	0.12 (0.06)	1.13 (1.00, 1.26)	4.1	0.04
Chronic Liver Disease	0.36 (0.13)	1.43 (1.12, 1.83)	7.9	<.01
Severe hematological disorders	0.03 (0.14)	1.03 (0.78, 1.37)	0.1	0.82
Iron deficiency or other/unspecified anemias and blood disease	0.16 (0.04)	1.17 (1.09, 1.26)	19.7	<.0001
Depression	-0.01 (0.05)	0.99 (0.90, 1.08)	0.1	0.77
Parkinson's and Huntington's diseases	0.07 (0.10)	1.07 (0.88, 1.30)	0.4	0.52
Seizure disorders and convulsions	0.49 (0.08)	1.64 (1.41, 1.90)	40.9	<.0001
Fibrosis of lung or other chronic lung disorders	0.13 (0.07)	1.14 (1.00, 1.30)	3.7	0.05
Asthma	-0.27 (0.08)	0.76 (0.66, 0.88)	13.2	<.001

Appendix Table 4b. AMI Risk Model for ICU or Intermediate Care Utilization The risk model for predicted ICU utilization in AMI was estimated from a 10% random sample of AMI patients treated nationwide (N=38,767), using binary logistic regression (c=0.64).

Variable	Estimate (SE)	Odds Ratio (95% CI)	Chi Sq	P
Intercept	1.04 (0.06)	0.00 (0.00, 0.00)	333.7	<.0001
<i>Patient Demographics</i>				
Age 65-69 (reference)	--	--	--	--
Age 70-74	-0.04 (0.04)	0.96 (0.89, 1.05)	0.8	0.37
Age 75-79	-0.04 (0.04)	0.96 (0.89, 1.04)	0.9	0.35
Age 80-84	-0.12 (0.04)	0.89 (0.82, 0.96)	8.1	<.01
Age 85+	-0.43 (0.04)	0.65 (0.60, 0.70)	118.3	<.0001
Sex (male)	0.10 (0.03)	1.11 (1.06, 1.17)	17.4	<.0001
Race- White (reference)	--	--	--	--
Race- Black	-0.05 (0.05)	0.95 (0.87, 1.04)	1.2	0.27
Race- Hispanic	0.26 (0.06)	1.30 (1.15, 1.46)	17.8	<.0001
Race- Other	0.18 (0.07)	1.20 (1.04, 1.38)	6.5	0.01
Emergent Type Admission	-0.07 (0.03)	0.94 (0.88, 0.99)	5.3	0.02
Treatment at another hospital's ED	-0.26 (0.22)	0.78 (0.51, 1.18)	1.4	0.24
Prior Dialysis Visit	-0.09 (0.15)	0.92 (0.68, 1.23)	0.3	0.56
<i>Principal Diagnoses</i>				
STEMI Type 1	1.18 (0.06)	3.24 (2.88, 3.64)	386.5	<.0001
STEMI Type 2	1.09 (0.05)	2.96 (2.70, 3.25)	521.2	<.0001
NSTEMI or unspecified MI (reference)	--	--	--	--
<i>Comorbidities</i>				
History of PTCA	0.00 (0.05)	1.00 (0.91, 1.10)	0.0	1.00
History of CABG	-0.18 (0.04)	0.83 (0.76, 0.91)	16.9	<.0001
Heart Failure	-0.04 (0.03)	0.96 (0.90, 1.02)	1.5	0.22
Myocardial Infarction	-0.29 (0.04)	0.75 (0.70, 0.80)	66.4	<.0001
Unstable Angina	-0.02 (0.04)	0.98 (0.91, 1.05)	0.3	0.57
Cardio-respiratory Failure or Shock	0.19 (0.05)	1.21 (1.10, 1.34)	14.6	<.001
Valvular Heart Disease	0.16 (0.03)	1.18 (1.12, 1.24)	35.9	<.0001
Hypertension	-0.03 (0.04)	0.97 (0.89, 1.05)	0.6	0.46
Stroke	-0.03 (0.06)	0.97 (0.87, 1.08)	0.4	0.54
Cerebrovascular Disease	0.04 (0.04)	1.04 (0.97, 1.12)	1.4	0.24
Renal Failure	-0.07 (0.03)	0.94 (0.88, 1.00)	4.1	0.04
COPD	0.05 (0.03)	1.05 (0.99, 1.11)	2.6	0.10
Pneumonia; pleural effusion/pneumothorax	0.22 (0.03)	1.24 (1.17, 1.33)	44.1	<.0001
Diabetes	0.03 (0.03)	1.03 (0.98, 1.09)	1.8	0.18
Malnutrition	0.06 (0.06)	1.06 (0.95, 1.19)	1.2	0.28
Dementia or other specified brain disorders	-0.25 (0.03)	0.78 (0.73, 0.83)	54.6	<.0001
Hemiplegia, paraplegia, paralysis, functional disability	-0.10 (0.06)	0.91 (0.81, 1.02)	2.9	0.09
Vascular disease and complications	-0.06 (0.03)	0.94 (0.88, 1.00)	4.3	0.04
Cancer	-0.20 (0.07)	0.82 (0.72, 0.93)	9.6	<.01
Trauma; other injuries	-0.06 (0.03)	0.95 (0.89, 1.00)	3.6	0.06
Major psychiatric disorders	-0.05 (0.05)	0.95 (0.87, 1.05)	1.0	0.31
Chronic Liver Disease	0.02 (0.11)	1.02 (0.82, 1.26)	0.0	0.87
Severe hematological disorders	-0.14 (0.12)	0.87 (0.69, 1.10)	1.3	0.26
Iron deficiency or other/unspecified anemias and blood disease	0.29 (0.03)	1.34 (1.27, 1.41)	118.1	<.0001
Depression	-0.13 (0.03)	0.88 (0.82, 0.94)	13.5	<.001
Parkinson's and Huntington's diseases	-0.13 (0.08)	0.88 (0.75, 1.03)	2.5	0.11
Seizure disorders and convulsions	0.14 (0.07)	1.15 (1.00, 1.32)	3.8	0.05
Fibrosis of lung or other chronic lung disorders	0.03 (0.06)	1.03 (0.92, 1.15)	0.2	0.64
Asthma	-0.07 (0.05)	0.93 (0.84, 1.03)	2.1	0.15

Appendix Table 4c. AMI Risk Model for Predicted Cost The risk model for predicted cost in AMI was estimated from a 10% random sample of AMI patients treated nationwide (N=38,767), using robust regression and m-estimation ($R^2=0.056$).

Variable	Estimate (SE)	95% CI	Chi Sq	P
Intercept	13420.7 (286.9)	12858.3, 13983.1	2187.5	<.0001
<i>Patient Demographics</i>				
Age 65-69 (reference)	--	--	--	--
Age 70-74	315.1 (204.0)	-84.6, 714.9	2.4	0.12
Age 75-79	484.3 (207.0)	78.6, 889.9	5.5	0.02
Age 80-84	265.4 (213.1)	-152.3, 683.1	1.6	0.21
Age 85+	-1980.4 (206.6)	-2385.3, -1575.4	91.9	<.0001
Sex (male)	714.7 (130.7)	458.5, 970.9	29.9	<.0001
Race- White (reference)	--	--	--	--
Race- Black	425.4 (244.9)	-54.6, 905.3	3.0	0.08
Race- Hispanic	1491.0 (302.0)	899.2, 2082.8	24.4	<.0001
Race- Other	967.1 (351.7)	277.8, 1656.3	7.6	<.01
Emergent Type Admission	-759.8 (147.4)	-1048.6, -470.9	26.6	<.0001
Treatment at another hospital's ED	289.8 (1129.4)	-1923.7, 2503.3	0.1	0.80
Prior Dialysis Visit	618.3 (795.1)	-940.1, 2176.6	0.6	0.44
<i>Principal Diagnoses</i>				
STEMI Type 1	3184.5 (233.7)	2726.5, 3642.5	185.7	<.0001
STEMI Type 2	1503.0 (193.7)	1123.4, 1882.7	60.2	<.0001
NSTEMI or unspecified MI (reference)	--	--	--	--
<i>Comorbidities</i>				
History of PTCA	-1262.2 (249.0)	-1750.2, -774.2	25.7	<.0001
History of CABG	-1825.7 (244.5)	-2304.9, -1346.5	55.8	<.0001
Heart Failure	-626.5 (171.4)	-962.4, -290.7	13.4	<.001
Myocardial Infarction	-2419.7 (195.9)	-2803.6, -2035.7	152.6	<.0001
Unstable Angina	-1463.9 (202.7)	-1861.2, -1066.6	52.2	<.0001
Cardio-respiratory Failure or Shock	325.8 (256.1)	-176.1, 827.8	1.6	0.20
Valvular Heart Disease	1903.5 (139.2)	1630.6, 2176.3	186.9	<.0001
Hypertension	283.5 (209.4)	-127.0, 693.9	1.8	0.18
Stroke	-74.0 (296.8)	-655.8, 507.8	0.1	0.80
Cerebrovascular Disease	517.8 (189.6)	146.1, 889.4	7.5	<.01
Renal Failure	-653.9 (173.3)	-993.5, -314.2	14.2	<.001
COPD	1188.2 (147.8)	898.5, 1477.9	64.6	<.0001
Pneumonia; pleural effusion/pneumothorax	4056.0 (167.4)	3727.8, 4384.1	586.9	<.0001
Diabetes	1505.8 (132.0)	1247.0, 1764.5	130.1	<.0001
Malnutrition	4752.2 (295.9)	4172.3, 5332.2	257.9	<.0001
Dementia or other specified brain disorders	-1027.5 (182.6)	-1385.3, -669.6	31.7	<.0001
Hemiplegia, paraplegia, paralysis, functional disability	-1143.9 (315.3)	-1761.8, -525.9	13.2	<.001
Vascular disease and complications	-232.6 (162.0)	-550.1, 85.0	2.1	0.15
Cancer	-1915.1 (347.5)	-2596.2, -1234.0	30.4	<.0001
Trauma; other injuries	225.4 (153.5)	-75.6, 526.3	2.2	0.14
Major psychiatric disorders	145.3 (254.7)	-353.9, 644.5	0.3	0.57
Chronic Liver Disease	962.5 (554.3)	-123.9, 2048.9	3.0	0.08
Severe hematological disorders	-1679.4 (641.1)	-2936.0, -422.8	6.9	<.01
Iron deficiency or other/unspecified anemias and blood disease	5850.0 (137.6)	5580.2, 6119.7	1807.0	<.0001
Depression	-929.2 (187.2)	-1296.1, -562.3	24.6	<.0001
Parkinson's and Huntington's diseases	-387.6 (443.7)	-1257.2, 481.9	0.8	0.38
Seizure disorders and convulsions	1434.5 (362.6)	723.8, 2145.3	15.7	<.0001
Fibrosis of lung or other chronic lung disorders	83.6 (296.6)	-497.7, 664.9	0.1	0.78
Asthma	-183.7 (267.4)	-707.9, 340.5	0.5	0.49
*Facility fees for ICU and intermediate care were assigned the same value in the cost risk score.				

Appendix Table 4d. AMI Risk Model for Predicted LOS The risk model for predicted LOS in AMI was estimated from a 10% random sample of AMI patients treated nationwide (N=38,767), using robust regression and m-estimation ($R^2=0.078$).

Variable	Estimate (SE)	95% CI	Chi Sq	P
Intercept	2.9 (0.1)	2.8, 3.0	2139.2	<.0001
<i>Patient Demographics</i>				
Age 65-69 (reference)	--	--	--	--
Age 70-74	0.1 (0.0)	0.0, 0.2	2.3	0.13
Age 75-79	0.1 (0.0)	0.0, 0.2	9.3	<.01
Age 80-84	0.2 (0.0)	0.1, 0.3	19.4	<.0001
Age 85+	0.0 (0.0)	-0.1, 0.1	0.6	0.46
Sex (male)	0.0 (0.0)	0.0, 0.1	1.9	0.16
Race- White (reference)	--	--	--	--
Race- Black	0.2 (0.1)	0.1, 0.3	15.3	<.0001
Race- Hispanic	0.2 (0.1)	0.0, 0.3	5.7	0.02
Race- Other	0.0 (0.1)	-0.1, 0.2	0.4	0.52
Emergent Type Admission	-0.3 (0.0)	-0.3, -0.2	66.3	<.0001
Treatment at another hospital's ED	-0.2 (0.2)	-0.6, 0.3	0.4	0.53
Prior Dialysis Visit	0.1 (0.2)	-0.2, 0.4	0.4	0.55
<i>Principal Diagnoses</i>				
STEMI Type 1	0.3 (0.1)	0.2, 0.4	40.0	<.0001
STEMI Type 2	-0.1 (0.0)	-0.1, 0.0	2.1	0.15
NSTEMI or unspecified MI (reference)	--	--	--	--
<i>Comorbidities</i>				
History of PTCA	-0.3 (0.1)	-0.4, -0.2	38.1	<.0001
History of CABG	-0.3 (0.1)	-0.4, -0.2	34.0	<.0001
Heart Failure	0.0 (0.0)	-0.1, 0.1	0.4	0.53
Myocardial Infarction	-0.4 (0.0)	-0.4, -0.3	67.9	<.0001
Unstable Angina	-0.3 (0.0)	-0.4, -0.2	43.5	<.0001
Cardio-respiratory Failure or Shock	0.2 (0.1)	0.1, 0.3	8.7	<.01
Valvular Heart Disease	0.4 (0.0)	0.3, 0.5	172.1	<.0001
Hypertension	0.0 (0.0)	-0.1, 0.1	0.4	0.53
Stroke	0.0 (0.1)	-0.2, 0.1	0.4	0.53
Cerebrovascular Disease	0.1 (0.0)	0.0, 0.2	7.8	<.01
Renal Failure	0.0 (0.0)	-0.1, 0.1	0.3	0.59
COPD	0.3 (0.0)	0.3, 0.4	101.6	<.0001
Pneumonia; pleural effusion/pneumothorax	1.1 (0.0)	1.0, 1.2	917.9	<.0001
Diabetes	0.3 (0.0)	0.3, 0.4	143.1	<.0001
Malnutrition	1.4 (0.1)	1.3, 1.6	486.0	<.0001
Dementia or other specified brain disorders	0.1 (0.0)	0.0, 0.1	2.6	0.11
Hemiplegia, paraplegia, paralysis, functional disability	-0.1 (0.1)	-0.3, 0.0	4.6	0.03
Vascular disease and complications	0.0 (0.0)	0.0, 0.1	1.5	0.22
Cancer	-0.2 (0.1)	-0.4, -0.1	9.1	<.01
Trauma; other injuries	0.1 (0.0)	0.1, 0.2	16.1	<.0001
Major psychiatric disorders	0.2 (0.1)	0.1, 0.3	9.0	<.01
Chronic Liver Disease	0.4 (0.1)	0.2, 0.7	12.2	<.001
Severe hematological disorders	-0.2 (0.1)	-0.4, 0.1	1.4	0.24
Iron deficiency or other/unspecified anemias and blood disease	1.3 (0.0)	1.3, 1.4	1900.8	<.0001
Depression	-0.1 (0.0)	-0.2, 0.0	3.8	0.05
Parkinson's and Huntington's diseases	0.0 (0.1)	-0.2, 0.2	0.0	0.91
Seizure disorders and convulsions	0.3 (0.1)	0.1, 0.4	12.6	<.001
Fibrosis of lung or other chronic lung disorders	-0.1 (0.1)	-0.2, 0.1	0.6	0.43
Asthma	0.0 (0.1)	-0.1, 0.1	0.1	0.78

Appendix Table 5. HF Risk Models All HF risk models are based on a 10% random sample of patients admitted nationwide (N=62,050).

Appendix Table 5a. HF Risk Model for 30-Day Mortality The risk model for 30-day mortality in HF was estimated from a 10% random sample of HF patients treated nationwide (N=62,050), using binary logistic regression ($c=0.71$).

Variable	Odds Ratio			
	Estimate (SE)	(95% CI)	Chi Sq	P
Intercept	-3.35 (0.08)	0.00 (0.00, 0.00)	1695.5	<.0001
<i>Patient Demographics</i>				
Age 65-69 (reference)	--	--	--	--
Age 70-74	0.09 (0.07)	1.10 (0.96, 1.26)	1.7	0.19
Age 75-79	0.39 (0.06)	1.48 (1.31, 1.68)	37.1	<.0001
Age 80-84	0.54 (0.06)	1.71 (1.51, 1.93)	73.2	<.0001
Age 85+	1.00 (0.06)	2.72 (2.43, 3.05)	289.2	<.0001
Sex (male)	0.16 (0.03)	1.17 (1.11, 1.24)	29.7	<.0001
Race- White (reference)	--	--	--	--
Race- Black	-0.39 (0.05)	0.68 (0.61, 0.75)	53.6	<.0001
Race- Hispanic	-0.36 (0.08)	0.70 (0.60, 0.81)	23.0	<.0001
Race- Other	-0.24 (0.09)	0.79 (0.66, 0.95)	6.6	0.01
Emergent Type Admission	0.10 (0.04)	1.11 (1.04, 1.19)	8.6	<.01
Treatment at another hospital's ED	0.44 (0.81)	1.56 (0.32, 7.59)	0.3	0.58
Prior Dialysis Visit	0.55 (0.14)	1.74 (1.32, 2.30)	15.3	<.0001
<i>Principal Diagnoses</i>				
HF with Chronic Kidney Disease	0.21 (0.06)	1.23 (1.09, 1.38)	11.8	<.001
HF with Hypertension	-0.47 (0.11)	0.63 (0.51, 0.78)	17.5	<.0001
HF, other	--	--	--	--
<i>Comorbidities</i>				
History of PTCA	-0.09 (0.04)	0.92 (0.84, 1.00)	4.3	0.04
History of CABG	0.11 (0.03)	1.12 (1.05, 1.20)	11.7	<.001
Heart Failure	0.21 (0.07)	1.23 (1.07, 1.43)	7.9	<.01
Myocardial Infarction	-0.06 (0.06)	0.94 (0.84, 1.05)	1.1	0.29
Unstable Angina	0.27 (0.04)	1.31 (1.22, 1.40)	58.6	<.0001
Cardio-respiratory Failure or Shock	0.04 (0.03)	1.05 (0.99, 1.11)	2.4	0.12
Valvular Heart Disease	-0.46 (0.05)	0.63 (0.57, 0.70)	85.1	<.0001
Hypertension	-0.05 (0.05)	0.95 (0.86, 1.06)	0.8	0.37
Stroke	-0.03 (0.04)	0.97 (0.90, 1.05)	0.6	0.43
Cerebrovascular Disease	0.15 (0.03)	1.17 (1.10, 1.24)	23.9	<.0001
Renal Failure	0.15 (0.03)	1.16 (1.09, 1.23)	25.5	<.0001
COPD	0.30 (0.03)	1.35 (1.27, 1.43)	104.8	<.0001
Pneumonia; pleural effusion/pneumothorax	-0.06 (0.03)	0.94 (0.89, 1.00)	4.2	0.04
Diabetes	0.75 (0.04)	2.11 (1.95, 2.28)	352.7	<.0001
Malnutrition	0.41 (0.03)	1.51 (1.42, 1.61)	161.8	<.0001
Dementia or other specified brain disorders	0.20 (0.05)	1.22 (1.10, 1.35)	14.8	<.001
Hemiplegia, paraplegia, paralysis, functional disability	0.08 (0.03)	1.08 (1.02, 1.14)	6.2	0.01
Vascular disease and complications	0.71 (0.06)	2.04 (1.83, 2.27)	164.9	<.0001
Cancer	0.18 (0.03)	1.20 (1.13, 1.28)	37.6	<.0001
Trauma; other injuries	0.23 (0.04)	1.26 (1.16, 1.37)	28.1	<.0001
Major psychiatric disorders	0.46 (0.07)	1.58 (1.36, 1.83)	37.2	<.0001
Chronic Liver Disease	0.18 (0.08)	1.19 (1.02, 1.40)	4.8	0.03
Severe hematological disorders	0.16 (0.03)	1.18 (1.11, 1.25)	26.7	<.0001
Iron deficiency or other/unspecified anemias and blood disease	-0.07 (0.04)	0.93 (0.87, 1.00)	3.6	0.06
Depression	0.05 (0.08)	1.06 (0.90, 1.24)	0.4	0.52
Parkinson's and Huntington's diseases	0.07 (0.07)	1.07 (0.93, 1.23)	0.9	0.34
Seizure disorders and convulsions	0.11 (0.05)	1.12 (1.02, 1.23)	5.8	0.02
Fibrosis of lung or other chronic lung disorders	-0.17 (0.05)	0.84 (0.76, 0.93)	10.7	<.01
Asthma	-0.19 (0.05)	0.83 (0.75, 0.91)	13.9	<.001

Appendix Table 5b. HF Risk Model for ICU or Intermediate Care Utilization The risk model for predicted ICU utilization in HF was estimated from a 10% random sample of HF patients treated nationwide (N=62,050), using binary logistic regression (c=0.56).

Variable	Estimate (SE)	Odds Ratio (95% CI)	Chi Sq	P
Intercept	-0.04 (0.04)	0.00 (0.00, 0.00)	0.9	0.34
<i>Patient Demographics</i>				
Age 65-69 (reference)	--	--	--	--
Age 70-74	-0.04 (0.03)	0.96 (0.90, 1.02)	1.8	0.17
Age 75-79	-0.07 (0.03)	0.93 (0.88, 0.99)	4.9	0.03
Age 80-84	-0.12 (0.03)	0.89 (0.84, 0.95)	14.5	<.001
Age 85+	-0.21 (0.03)	0.81 (0.77, 0.86)	53.7	<.0001
Sex (male)	0.10 (0.02)	1.10 (1.07, 1.14)	32.9	<.0001
Race- White (reference)	--	--	--	--
Race- Black	0.01 (0.03)	1.01 (0.96, 1.06)	0.1	0.74
Race- Hispanic	0.39 (0.04)	1.48 (1.37, 1.60)	98.5	<.0001
Race- Other	0.34 (0.05)	1.40 (1.27, 1.55)	45.0	<.0001
Emergent Type Admission	0.01 (0.02)	1.01 (0.97, 1.05)	0.2	0.63
Treatment at another hospital's ED	0.74 (0.60)	2.09 (0.64, 6.85)	1.5	0.22
Prior Dialysis Visit	-0.07 (0.10)	0.94 (0.77, 1.14)	0.4	0.52
<i>Principal Diagnoses</i>				
HF with Chronic Kidney Disease	0.37 (0.04)	1.44 (1.34, 1.56)	93.5	<.0001
HF with Hypertension	0.25 (0.05)	1.29 (1.16, 1.42)	23.7	<.0001
HF, other	--	--	--	--
<i>Comorbidities</i>				
History of PTCA	-0.07 (0.03)	0.93 (0.89, 0.98)	7.5	<.01
History of CABG	-0.08 (0.02)	0.92 (0.89, 0.96)	18.1	<.0001
Heart Failure	0.10 (0.05)	1.10 (1.00, 1.22)	3.7	0.05
Myocardial Infarction	0.01 (0.04)	1.01 (0.94, 1.09)	0.1	0.72
Unstable Angina	0.08 (0.02)	1.09 (1.04, 1.14)	13.3	<.001
Cardio-respiratory Failure or Shock	0.17 (0.02)	1.18 (1.14, 1.22)	99.9	<.0001
Valvular Heart Disease	-0.04 (0.03)	0.96 (0.90, 1.02)	1.9	0.17
Hypertension	0.07 (0.03)	1.07 (1.01, 1.15)	4.4	0.04
Stroke	0.01 (0.02)	1.01 (0.97, 1.06)	0.2	0.65
Cerebrovascular Disease	-0.01 (0.02)	1.00 (0.96, 1.03)	0.1	0.78
Renal Failure	0.07 (0.02)	1.07 (1.03, 1.10)	14.7	<.001
COPD	0.13 (0.02)	1.14 (1.10, 1.17)	53.8	<.0001
Pneumonia; pleural effusion/pneumothorax	0.03 (0.02)	1.03 (1.00, 1.06)	2.8	0.10
Diabetes	0.16 (0.03)	1.17 (1.10, 1.25)	26.6	<.0001
Malnutrition	-0.04 (0.02)	0.96 (0.92, 1.00)	4.1	0.04
Dementia or other specified brain disorders	-0.06 (0.03)	0.95 (0.88, 1.01)	2.7	0.10
Hemiplegia, paraplegia, paralysis, functional disability	0.02 (0.02)	1.02 (0.99, 1.06)	1.6	0.20
Vascular disease and complications	-0.08 (0.04)	0.93 (0.85, 1.00)	3.5	0.06
Cancer	-0.01 (0.02)	0.99 (0.95, 1.02)	0.5	0.50
Trauma; other injuries	0.02 (0.03)	1.02 (0.96, 1.08)	0.5	0.48
Major psychiatric disorders	0.03 (0.05)	1.04 (0.94, 1.14)	0.5	0.49
Chronic Liver Disease	0.05 (0.06)	1.05 (0.94, 1.17)	0.7	0.40
Severe hematological disorders	0.05 (0.02)	1.06 (1.02, 1.09)	9.5	<.01
Iron deficiency or other/unspecified anemias and blood disease	-0.10 (0.02)	0.90 (0.87, 0.94)	22.5	<.0001
Depression	-0.01 (0.05)	0.99 (0.89, 1.10)	0.1	0.79
Parkinson's and Huntington's diseases	0.02 (0.05)	1.02 (0.94, 1.12)	0.2	0.63
Seizure disorders and convulsions	-0.04 (0.03)	0.96 (0.91, 1.02)	1.8	0.18
Fibrosis of lung or other chronic lung disorders	-0.01 (0.03)	0.99 (0.94, 1.05)	0.1	0.77
Asthma	0.01 (0.03)	1.01 (0.95, 1.07)	0.1	0.80

Appendix Table 5c. HF Risk Model for Predicted Cost The risk model for predicted cost in HF was estimated from a 10% random sample of HF patients treated nationwide (N=62,050), using robust regression and m-estimation ($R^2=0.025$).

Variable	Estimate (SE)	95% CI	Chi Sq	P
Intercept	12225.5 (228.3)	11778.1, 12672.8	2868.4	<.0001
<i>Patient Demographics</i>				
Age 65-69 (reference)	--	--	--	--
Age 70-74	-240.1 (164.8)	-563.1, 82.9	2.1	0.15
Age 75-79	-217.6 (160.7)	-532.6, 97.4	1.8	0.18
Age 80-84	-274.5 (157.8)	-583.8, 34.7	3.0	0.08
Age 85+	-737.4 (149.2)	-1029.8, -445.0	24.4	<.0001
Sex (male)	279.5 (87.8)	107.3, 451.7	10.1	<.01
Race- White (reference)	--	--	--	--
Race- Black	366.4 (139.2)	93.6, 639.2	6.9	<.01
Race- Hispanic	1382.5 (201.5)	987.6, 1777.4	47.1	<.0001
Race- Other	1063.5 (256.8)	560.1, 1566.8	17.2	<.0001
Emergent Type Admission	-126.2 (102.5)	-327.1, 74.6	1.5	0.22
Treatment at another hospital's ED	1351.8 (2906.5)	-4344.8, 7048.5	0.2	0.64
Prior Dialysis Visit	801.2 (527.8)	-233.2, 1835.6	2.3	0.13
<i>Principal Diagnosis</i>				
HF with Chronic Kidney Disease	4364.6 (193.6)	3985.2, 4744.1	508.2	<.0001
HF with Hypertension	-116.2 (266.7)	-638.9, 406.4	0.2	0.66
HF, other	--	--	--	--
<i>Comorbidities</i>				
History of PTCA	-516.1 (155.8)	-821.4, -210.7	11.0	<.001
History of CABG	-634.3 (134.3)	-897.5, -371.1	22.3	<.0001
Heart Failure	-1011.3 (96.5)	-1200.4, -822.2	109.8	<.0001
Myocardial Infarction	313.1 (263.6)	-203.6, 829.7	1.4	0.24
Unstable Angina	-541.6 (185.3)	-904.8, -178.4	8.5	<.01
Cardio-respiratory Failure or Shock	138.7 (118.2)	-93.0, 370.4	1.4	0.24
Valvular Heart Disease	1094.0 (86.5)	924.6, 1263.5	160.1	<.0001
Hypertension	-740.1 (164.4)	-1062.3, -417.9	20.3	<.0001
Stroke	-73.6 (174.1)	-414.8, 267.6	0.2	0.67
Cerebrovascular Disease	-71.6 (120.2)	-307.2, 163.9	0.4	0.55
Renal Failure	77.8 (97.3)	-112.8, 268.5	0.6	0.42
COPD	991.6 (89.1)	816.9, 1166.2	123.9	<.0001
Pneumonia; pleural effusion/pneumothorax	1696.9 (89.5)	1521.4, 1872.3	359.4	<.0001
Diabetes	769.4 (89.0)	595.1, 943.8	74.8	<.0001
Malnutrition	3146.9 (159.3)	2834.7, 3459.0	390.4	<.0001
Dementia or other specified brain disorders	224.9 (111.2)	7.0, 442.9	4.1	0.04
Hemiplegia, paraplegia, paralysis, functional disability	328.1 (180.4)	-25.5, 681.8	3.3	0.07
Vascular disease and complications	252.2 (95.9)	64.1, 440.2	6.9	<.01
Cancer	451.1 (213.6)	32.4, 869.7	4.5	0.03
Trauma; other injuries	309.6 (97.2)	119.2, 500.1	10.2	<.01
Major psychiatric disorders	405.4 (151.6)	108.4, 702.5	7.2	<.01
Chronic Liver Disease	1771.1 (260.7)	1260.2, 2282.0	46.2	<.0001
Severe hematological disorders	867.6 (288.2)	302.8, 1432.4	9.1	<.01
Iron deficiency or other/unspecified anemias and blood disease	1503.0 (92.2)	1322.3, 1683.7	265.8	<.0001
Depression	-212.6 (112.8)	-433.7, 8.5	3.6	0.06
Parkinson's and Huntington's diseases	389.9 (277.9)	-154.8, 934.5	2.0	0.16
Seizure disorders and convulsions	239.2 (237.3)	-225.9, 704.3	1.0	0.31
Fibrosis of lung or other chronic lung disorders	180.6 (156.3)	-125.7, 486.9	1.3	0.25
Asthma	29.3 (151.8)	-268.1, 326.8	0.0	0.85
*Facility fees for ICU and intermediate care were both assigned the same value in the cost risk score.				

Appendix Table 5d. HF Risk Model for Predicted LOS The risk model for predicted LOS in HF was estimated from a 10% random sample of HF patients treated nationwide (N=62,050), using robust regression and m-estimation ($R^2=0.035$).

Variable	Estimate (SE)	95% CI	Chi Sq	P
Intercept	3.8 (0.1)	3.7, 3.9	4144.0	<.0001
<i>Patient Demographics</i>				
Age 65-69 (reference)	--	--	--	--
Age 70-74	0.0 (0.0)	-0.1, 0.0	1.4	0.24
Age 75-79	0.0 (0.0)	-0.1, 0.1	0.0	0.90
Age 80-84	0.1 (0.0)	0.0, 0.1	2.3	0.13
Age 85+	0.0 (0.0)	-0.1, 0.1	0.3	0.59
Sex (male)	0.0 (0.0)	-0.1, 0.0	3.8	0.05
Race- White (reference)	--	--	--	--
Race- Black	0.1 (0.0)	0.1, 0.2	15.3	<.0001
Race- Hispanic	0.0 (0.1)	-0.1, 0.1	0.1	0.76
Race- Other	0.0 (0.1)	-0.1, 0.2	0.6	0.45
Emergent Type Admission	-0.1 (0.0)	-0.1, 0.0	12.2	<.001
Treatment at another hospital's ED	1.0 (0.7)	-0.4, 2.5	1.9	0.17
Prior Dialysis Visit	0.2 (0.1)	-0.1, 0.4	1.4	0.25
<i>Principal Diagnoses</i>				
HF with Chronic Kidney Disease	1.0 (0.0)	0.9, 1.1	414.6	<.0001
HF with Hypertension	-0.3 (0.1)	-0.5, -0.2	22.7	<.0001
HF, other	--	--	--	--
<i>Comorbidities</i>				
History of PTCA	-0.2 (0.0)	-0.3, -0.1	24.3	<.0001
History of CABG	-0.1 (0.0)	-0.2, -0.1	13.9	<.001
Heart Failure	-0.2 (0.0)	-0.3, -0.2	89.8	<.0001
Myocardial Infarction	0.0 (0.1)	-0.1, 0.2	0.1	0.76
Unstable Angina	-0.2 (0.0)	-0.3, -0.1	15.5	<.0001
Cardio-respiratory Failure or Shock	0.1 (0.0)	0.0, 0.1	4.1	0.04
Valvular Heart Disease	0.2 (0.0)	0.1, 0.2	68.9	<.0001
Hypertension	-0.3 (0.0)	-0.4, -0.2	41.5	<.0001
Stroke	-0.1 (0.0)	-0.2, 0.0	6.3	0.01
Cerebrovascular Disease	-0.1 (0.0)	-0.1, 0.0	4.1	0.04
Renal Failure	0.1 (0.0)	0.0, 0.1	5.8	0.02
COPD	0.3 (0.0)	0.3, 0.4	206.9	<.0001
Pneumonia; pleural effusion/pneumothorax	0.5 (0.0)	0.5, 0.6	537.4	<.0001
Diabetes	0.2 (0.0)	0.2, 0.3	102.6	<.0001
Malnutrition	1.1 (0.0)	1.0, 1.2	689.5	<.0001
Dementia or other specified brain disorders	0.2 (0.0)	0.1, 0.2	30.1	<.0001
Hemiplegia, paraplegia, paralysis, functional disability	0.2 (0.0)	0.1, 0.3	20.5	<.0001
Vascular disease and complications	0.0 (0.0)	0.0, 0.1	3.9	0.05
Cancer	0.2 (0.1)	0.1, 0.3	9.9	<.01
Trauma; other injuries	0.1 (0.0)	0.1, 0.2	29.7	<.0001
Major psychiatric disorders	0.1 (0.0)	0.1, 0.2	13.4	<.001
Chronic Liver Disease	0.6 (0.1)	0.4, 0.7	68.7	<.0001
Severe hematological disorders	0.2 (0.1)	0.0, 0.3	6.6	0.01
Iron deficiency or other/unspecified anemias and blood disease	0.5 (0.0)	0.4, 0.5	377.2	<.0001
Depression	0.1 (0.0)	0.0, 0.1	7.2	<.01
Parkinson's and Huntington's diseases	0.1 (0.1)	0.0, 0.3	4.2	0.04
Seizure disorders and convulsions	0.1 (0.1)	-0.1, 0.2	0.8	0.38
Fibrosis of lung or other chronic lung disorders	0.1 (0.0)	0.0, 0.2	4.0	0.05
Asthma	0.0 (0.0)	-0.1, 0.1	0.2	0.68

Appendix Table 6. PNA Risk Models All PNA risk models are based on a 10% random sample of patients admitted nationwide (N=72,508).

Appendix Table 6a. PNA Risk Model for 30-Day Mortality The risk model for 30-day mortality in PNA was estimated from a 10% random sample of PNA patients treated nationwide (N=72,508), using binary logistic regression (c=0.75).

Variable	Estimate (SE)	Odds Ratio (95% CI)	Chi Sq	P
Intercept	-3.55 (0.07)	0.00 (0.00, 0.00)	2906.1	<.0001
<i>Patient Demographics</i>				
Age 65-69 (reference)	--	--	--	--
Age 70-74	0.18 (0.05)	1.20 (1.08, 1.33)	12.1	<.001
Age 75-79	0.29 (0.05)	1.34 (1.21, 1.48)	32.6	<.0001
Age 80-84	0.51 (0.05)	1.67 (1.51, 1.84)	107.0	<.0001
Age 85+	0.89 (0.05)	2.44 (2.23, 2.67)	366.0	<.0001
Sex (male)	0.15 (0.02)	1.16 (1.11, 1.21)	37.6	<.0001
Race- White (reference)	--	--	--	--
Race- Black	-0.19 (0.05)	0.82 (0.75, 0.90)	17.2	<.0001
Race- Hispanic	-0.29 (0.06)	0.75 (0.67, 0.84)	24.6	<.0001
Race- Other	-0.15 (0.07)	0.86 (0.75, 0.98)	5.0	0.03
Emergent Type Admission	0.09 (0.03)	1.09 (1.03, 1.16)	8.6	<.01
Treatment at another hospital's ED	0.39 (0.84)	1.48 (0.29, 7.61)	0.2	0.64
Prior Dialysis Visit	0.68 (0.11)	1.96 (1.57, 2.46)	35.1	<.0001
<i>Principal Diagnoses</i>				
Pneumonia due to anaerobe or GN bacteria	0.18 (0.07)	1.20 (1.04, 1.38)	6.1	0.01
Aspiration pneumonia	0.89 (0.03)	2.43 (2.30, 2.56)	1068.3	<.0001
Haemophilus Influenza pneumonia	-0.34 (0.28)	0.71 (0.41, 1.24)	1.5	0.23
Pneumonia due to MRSA, Pseudomonas, or Legionnaires' disease	0.41 (0.06)	1.50 (1.32, 1.70)	39.8	<.0001
Pneumococcal pneumonia	-0.22 (0.15)	0.80 (0.60, 1.07)	2.3	0.13
Pneumonia due to Staphylococcus or Streptococcus	-0.08 (0.21)	0.93 (0.61, 1.41)	0.1	0.72
Viral pneumonia	-0.08 (0.09)	0.92 (0.77, 1.10)	0.8	0.37
Pneumonia, other	--	--	--	--
<i>Comorbidities</i>				
History of PTCA	-0.08 (0.05)	0.92 (0.83, 1.02)	2.3	0.13
History of CABG	-0.01 (0.05)	0.99 (0.90, 1.09)	0.1	0.82
Heart Failure	0.20 (0.03)	1.22 (1.16, 1.29)	54.4	<.0001
Myocardial Infarction	0.14 (0.09)	1.15 (0.97, 1.37)	2.7	0.10
Unstable Angina	-0.14 (0.06)	0.87 (0.77, 0.99)	4.6	0.03
Cardio-respiratory Failure or Shock	0.26 (0.03)	1.30 (1.22, 1.37)	76.1	<.0001
Valvular Heart Disease	0.04 (0.03)	1.04 (0.99, 1.10)	2.1	0.15
Hypertension	-0.12 (0.04)	0.89 (0.83, 0.95)	11.8	<.001
Stroke	0.05 (0.04)	1.05 (0.98, 1.14)	1.7	0.19
Cerebrovascular Disease	0.00 (0.03)	1.00 (0.94, 1.06)	0.0	0.91
Renal Failure	0.13 (0.03)	1.14 (1.08, 1.20)	21.6	<.0001
COPD	-0.01 (0.02)	0.99 (0.94, 1.03)	0.4	0.55
Pneumonia; pleural effusion/pneumothorax	0.12 (0.03)	1.12 (1.05, 1.20)	13.1	<.001
Diabetes	-0.07 (0.02)	0.93 (0.89, 0.98)	7.6	<.01
Malnutrition	0.72 (0.03)	2.05 (1.94, 2.16)	655.3	<.0001
Dementia or other specified brain disorders	0.50 (0.03)	1.64 (1.56, 1.73)	357.4	<.0001
Hemiplegia, paraplegia, paralysis, functional disability	0.13 (0.04)	1.14 (1.06, 1.23)	13.0	<.001
Vascular disease and complications	0.06 (0.03)	1.06 (1.01, 1.11)	4.9	0.03
Cancer	1.16 (0.03)	3.19 (2.98, 3.41)	1163.2	<.0001
Trauma; other injuries	0.18 (0.02)	1.20 (1.15, 1.26)	56.4	<.0001
Major psychiatric disorders	0.05 (0.03)	1.05 (0.99, 1.11)	2.2	0.14
Chronic Liver Disease	0.39 (0.07)	1.48 (1.28, 1.71)	27.5	<.0001
Severe hematological disorders	0.13 (0.07)	1.14 (0.99, 1.31)	3.1	0.08
Iron deficiency or other/unspecified anemias and blood disease	0.13 (0.03)	1.13 (1.08, 1.19)	23.9	<.0001
Depression	-0.02 (0.03)	0.98 (0.93, 1.03)	0.7	0.40
Parkinson's and Huntington's diseases	0.09 (0.05)	1.10 (1.00, 1.20)	4.0	0.05

Variable	Estimate (SE)	Odds Ratio (95% CI)	Chi Sq	P
Seizure disorders and convulsions	-0.03 (0.04)	0.97 (0.89, 1.05)	0.6	0.44
Fibrosis of lung or other chronic lung disorders	0.10 (0.03)	1.10 (1.03, 1.18)	8.5	<.01
Asthma	-0.30 (0.04)	0.74 (0.68, 0.81)	47.2	<.0001

Appendix Table 6b. PNA Risk Model for ICU or Intermediate Care Utilization The risk model for predicted ICU utilization in PNA was estimated from a 10% random sample of PNA patients treated nationwide (N=72,508), using binary logistic regression (c=0.62).

Variable	Estimate (SE)	Odds Ratio (95% CI)	Chi Sq	P
Intercept	-1.14 (0.04)	0.00 (0.00, 0.00)	784.8	<.0001
<i>Patient Demographics</i>				
Age 65-69 (reference)	--	--	--	--
Age 70-74	-0.03 (0.03)	0.97 (0.91, 1.03)	1.3	0.26
Age 75-79	-0.09 (0.03)	0.92 (0.86, 0.97)	9.0	<.01
Age 80-84	-0.11 (0.03)	0.90 (0.85, 0.95)	13.6	<.001
Age 85+	-0.19 (0.03)	0.83 (0.78, 0.87)	47.9	<.0001
Sex (male)	0.06 (0.02)	1.06 (1.02, 1.09)	11.2	<.001
Race- White (reference)	--	--	--	--
Race- Black	0.02 (0.03)	1.02 (0.96, 1.08)	0.3	0.56
Race- Hispanic	0.43 (0.04)	1.54 (1.43, 1.65)	141.0	<.0001
Race- Other	0.16 (0.04)	1.17 (1.07, 1.28)	12.6	<.001
Emergent Type Admission	0.17 (0.02)	1.19 (1.14, 1.24)	72.1	<.0001
Treatment at another hospital's ED	0.64 (0.68)	1.89 (0.50, 7.16)	0.9	0.35
Prior Dialysis Visit	0.05 (0.09)	1.05 (0.88, 1.26)	0.3	0.57
<i>Principal Diagnoses</i>				
Pneumonia due to anaerobe or GN bacteria	0.08 (0.05)	1.09 (0.98, 1.20)	2.7	0.10
Aspiration pneumonia	0.46 (0.02)	1.58 (1.51, 1.65)	438.8	<.0001
Haemophilus Influenza pneumonia	0.53 (0.14)	1.70 (1.28, 2.25)	13.6	<.001
Pneumonia due to MRSA, Pseudomonas, or Legionnaires' disease	0.35 (0.05)	1.42 (1.30, 1.55)	59.4	<.0001
Pneumococcal pneumonia	0.05 (0.08)	1.06 (0.91, 1.23)	0.5	0.48
Pneumonia due to Staphylococcus or Streptococcus	0.29 (0.12)	1.34 (1.05, 1.71)	5.5	0.02
Viral pneumonia	0.22 (0.05)	1.24 (1.12, 1.38)	17.2	<.0001
Pneumonia, other	--	--	--	--
<i>Comorbidities</i>				
History of PTCA	-0.01 (0.04)	0.99 (0.92, 1.07)	0.1	0.81
History of CABG	-0.02 (0.03)	0.98 (0.92, 1.05)	0.3	0.58
Heart Failure	0.13 (0.02)	1.13 (1.09, 1.18)	43.3	<.0001
Myocardial Infarction	0.18 (0.07)	1.20 (1.05, 1.37)	7.2	<.01
Unstable Angina	0.05 (0.05)	1.05 (0.96, 1.14)	1.0	0.31
Cardio-respiratory Failure or Shock	0.26 (0.02)	1.29 (1.24, 1.35)	141.6	<.0001
Valvular Heart Disease	0.32 (0.02)	1.37 (1.32, 1.43)	259.7	<.0001
Hypertension	0.09 (0.02)	1.10 (1.05, 1.15)	14.9	<.001
Stroke	-0.02 (0.03)	0.99 (0.93, 1.05)	0.3	0.61
Cerebrovascular Disease	-0.02 (0.02)	0.98 (0.94, 1.02)	0.8	0.36
Renal Failure	0.07 (0.02)	1.08 (1.04, 1.12)	14.3	<.001
COPD	0.21 (0.02)	1.23 (1.19, 1.27)	153.5	<.0001
Pneumonia; pleural effusion/pneumothorax	-0.22 (0.02)	0.80 (0.77, 0.83)	113.1	<.0001
Diabetes	0.12 (0.02)	1.12 (1.09, 1.16)	46.4	<.0001
Malnutrition	0.23 (0.02)	1.26 (1.20, 1.32)	100.0	<.0001
Dementia or other specified brain disorders	-0.05 (0.02)	0.95 (0.92, 0.99)	6.2	0.01
Hemiplegia, paraplegia, paralysis, functional disability	0.06 (0.03)	1.06 (1.01, 1.13)	4.6	0.03
Vascular disease and complications	0.01 (0.02)	1.01 (0.97, 1.05)	0.3	0.60
Cancer	-0.02 (0.03)	0.99 (0.93, 1.04)	0.3	0.59
Trauma; other injuries	-0.01 (0.02)	0.99 (0.96, 1.03)	0.3	0.62
Major psychiatric disorders	0.01 (0.02)	1.01 (0.97, 1.06)	0.2	0.68
Chronic Liver Disease	0.00 (0.06)	1.00 (0.90, 1.11)	0.0	0.98
Severe hematological disorders	-0.03 (0.06)	0.97 (0.87, 1.08)	0.3	0.59
Iron deficiency or other/unspecified anemias and blood disease	0.16 (0.02)	1.18 (1.14, 1.22)	91.4	<.0001
Depression	-0.09 (0.02)	0.92 (0.88, 0.95)	20.6	<.0001
Parkinson's and Huntington's diseases	-0.07 (0.04)	0.93 (0.87, 1.00)	3.7	0.06
Seizure disorders and convulsions	0.07 (0.03)	1.08 (1.01, 1.15)	5.1	0.02
Fibrosis of lung or other chronic lung disorders	0.04 (0.02)	1.04 (0.99, 1.09)	2.9	0.09
Asthma	-0.09 (0.03)	0.92 (0.87, 0.96)	11.5	<.001

Appendix Table 6c. PNA Risk Model for Predicted Cost The risk model for predicted cost in PNA was estimated from a 10% random sample of PNA patients treated nationwide (N=72,508), using robust regression and m-estimation ($R^2=0.054$).

Variable	Estimate (SE)	95% CI	Chi Sq	P
Intercept	8171.4 (169.7)	7838.7, 8504.1	2317.6	<.0001
<i>Patient Demographics</i>				
Age 65-69 (reference)	--	--	--	--
Age 70-74	-62.4 (126.4)	-310.1, 185.4	0.2	0.62
Age 75-79	-32.5 (125.0)	-277.5, 212.4	0.1	0.79
Age 80-84	114.5 (123.7)	-128.0, 356.9	0.9	0.35
Age 85+	20.5 (117.1)	-209.0, 250.1	0.0	0.86
Sex (male)	-224.6 (69.1)	-360.1, -89.1	10.6	<.01
Race- White (reference)	--	--	--	--
Race- Black	670.0 (130.7)	413.8, 926.2	26.3	<.0001
Race- Hispanic	1710.6 (158.4)	1400.2, 2021.1	116.7	<.0001
Race- Other	457.0 (191.4)	81.7, 832.2	5.7	0.02
Emergent Type Admission	714.8 (84.4)	549.3, 880.3	71.7	<.0001
Treatment at another hospital's ED	2654.2 (2991.5)	-3209.1, 8517.5	0.8	0.37
Prior Dialysis Visit	1823.0 (394.8)	1049.2, 2596.8	21.3	<.0001
<i>Principal Diagnoses</i>				
Pneumonia due to anaerobe or GN bacteria	2561.7 (215.5)	2139.4, 2984.1	141.3	<.0001
Aspiration pneumonia	3458.3 (93.8)	3274.3, 3642.2	1358.3	<.0001
Haemophilus Influenza pneumonia	3327.1 (629.6)	2093.0, 4561.1	27.9	<.0001
Pneumonia due to MRSA, Pseudomonas, or Legionnaires' disease	6838.9 (198.2)	6450.4, 7227.4	1190.3	<.0001
Pneumococcal pneumonia	1096.9 (326.8)	456.3, 1737.4	11.3	<.001
Pneumonia due to Staphylococcus or Streptococcus	2111.1 (540.6)	1051.6, 3170.6	15.3	<.0001
Viral pneumonia	1672.2 (221.9)	1237.4, 2107.0	56.8	<.0001
Pneumonia, other	--	--	--	--
<i>Comorbidities</i>				
History of PTCA	-133.8 (155.7)	-438.9, 171.4	0.7	0.39
History of CABG	-409.0 (146.7)	-696.5, -121.4	7.8	<.01
Heart Failure	617.5 (81.4)	458.0, 777.1	57.6	<.0001
Myocardial Infarction	419.3 (296.7)	-162.2, 1000.9	2.0	0.16
Unstable Angina	128.7 (196.0)	-255.5, 512.9	0.4	0.51
Cardio-respiratory Failure or Shock	671.7 (93.0)	489.5, 853.9	52.2	<.0001
Valvular Heart Disease	1778.4 (84.2)	1613.3, 1943.5	445.6	<.0001
Hypertension	538.4 (101.0)	340.3, 736.4	28.4	<.0001
Stroke	-286.1 (128.8)	-538.6, -33.5	4.9	0.03
Cerebrovascular Disease	-36.9 (93.5)	-220.3, 146.4	0.2	0.69
Renal Failure	190.8 (84.0)	26.2, 355.5	5.2	0.02
COPD	1377.6 (70.8)	1238.8, 1516.3	378.6	<.0001
Pneumonia; pleural effusion/pneumothorax	-1445.3 (89.4)	-1620.5, -1270.1	261.4	<.0001
Diabetes	864.0 (71.2)	724.5, 1003.5	147.3	<.0001
Malnutrition	3153.8 (99.6)	2958.6, 3348.9	1003.5	<.0001
Dementia or other specified brain disorders	250.8 (80.5)	92.9, 408.6	9.7	<.01
Hemiplegia, paraplegia, paralysis, functional disability	608.3 (123.3)	366.6, 849.9	24.3	<.0001
Vascular disease and complications	158.3 (76.8)	7.8, 308.8	4.3	0.04
Cancer	534.9 (117.7)	304.3, 765.6	20.7	<.0001
Trauma; other injuries	241.9 (73.5)	97.9, 386.0	10.8	<.01
Major psychiatric disorders	111.2 (96.8)	-78.4, 300.9	1.3	0.25
Chronic Liver Disease	393.4 (238.9)	-74.7, 861.6	2.7	0.10
Severe hematological disorders	808.7 (237.0)	344.2, 1273.1	11.7	<.001
Iron deficiency or other/unspecified anemias and blood disease	1588.4 (71.8)	1447.6, 1729.1	489.1	<.0001
Depression	-139.7 (81.2)	-298.8, 19.4	3.0	0.09
Parkinson's and Huntington's diseases	249.8 (153.3)	-50.7, 550.3	2.7	0.10
Seizure disorders and convulsions	649.4 (140.3)	374.5, 924.4	21.4	<.0001
Fibrosis of lung or other chronic lung disorders	677.9 (100.0)	481.9, 873.8	46.0	<.0001
Asthma	-234.8 (109.8)	-450.0, -19.6	4.6	0.03

*Facility fees for ICU and intermediate care were both assigned the same value in the cost risk score.

Appendix Table 6d. PNA Risk Model for Predicted LOS The risk model for predicted LOS in PNA was estimated from a 10% random sample of PNA patients treated nationwide (N=72,508), using robust regression and m-estimation ($R^2=0.066$).

Variable	Estimate (SE)	95% CI	Chi Sq	P
Intercept	3.5 (0.1)	3.4, 3.6	4244.6	<.0001
<i>Patient Demographics</i>				
Age 65-69 (reference)	--	--	--	--
Age 70-74	0.0 (0.0)	-0.1, 0.1	0.5	0.49
Age 75-79	0.1 (0.0)	0.0, 0.2	9.0	<.01
Age 80-84	0.2 (0.0)	0.1, 0.3	28.4	<.0001
Age 85+	0.3 (0.0)	0.2, 0.3	50.5	<.0001
Sex (male)	-0.2 (0.0)	-0.2, -0.1	60.1	<.0001
Race- White (reference)	--	--	--	--
Race- Black	0.3 (0.0)	0.2, 0.3	40.7	<.0001
Race- Hispanic	0.1 (0.0)	0.0, 0.2	2.4	0.12
Race- Other	0.0 (0.1)	-0.1, 0.1	0.0	0.99
Emergent Type Admission	0.0 (0.0)	0.0, 0.1	1.4	0.23
Treatment at another hospital's ED	-0.3 (0.9)	-2.2, 1.5	0.1	0.72
Prior Dialysis Visit	0.5 (0.1)	0.3, 0.8	16.8	<.0001
<i>Principal Diagnoses</i>				
Pneumonia due to anaerobe or GN bacteria	1.2 (0.1)	1.0, 1.3	298.4	<.0001
Aspiration pneumonia	1.0 (0.0)	1.0, 1.1	1259.6	<.0001
Haemophilus Influenza pneumonia	1.0 (0.2)	0.6, 1.3	23.1	<.0001
Pneumonia due to MRSA, Pseudomonas, or Legionnaires' disease	2.7 (0.1)	2.6, 2.9	1923.1	<.0001
Pneumococcal pneumonia	0.5 (0.1)	0.3, 0.7	21.4	<.0001
Pneumonia due to Staphylococcus or Streptococcus	0.8 (0.2)	0.5, 1.1	22.4	<.0001
Viral pneumonia	0.7 (0.1)	0.5, 0.8	90.4	<.0001
Pneumonia, other	--	--	--	--
<i>Comorbidities</i>				
History of PTCA	-0.1 (0.0)	-0.2, 0.0	1.7	0.19
History of CABG	-0.1 (0.0)	-0.2, 0.0	7.2	<.01
Heart Failure	0.2 (0.0)	0.1, 0.2	47.1	<.0001
Myocardial Infarction	-0.1 (0.1)	-0.2, 0.1	0.4	0.55
Unstable Angina	0.0 (0.1)	-0.2, 0.1	0.3	0.58
Cardio-respiratory Failure or Shock	0.1 (0.0)	0.1, 0.2	21.3	<.0001
Valvular Heart Disease	0.4 (0.0)	0.3, 0.4	177.3	<.0001
Hypertension	0.2 (0.0)	0.1, 0.2	26.8	<.0001
Stroke	-0.1 (0.0)	-0.1, 0.0	1.8	0.18
Cerebrovascular Disease	0.0 (0.0)	-0.1, 0.1	0.0	0.99
Renal Failure	0.0 (0.0)	0.0, 0.1	0.2	0.63
COPD	0.4 (0.0)	0.4, 0.4	329.0	<.0001
Pneumonia; pleural effusion/pneumothorax	-0.4 (0.0)	-0.5, -0.3	201.9	<.0001
Diabetes	0.2 (0.0)	0.2, 0.3	108.2	<.0001
Malnutrition	1.2 (0.0)	1.1, 1.2	1369.6	<.0001
Dementia or other specified brain disorders	0.2 (0.0)	0.1, 0.2	49.1	<.0001
Hemiplegia, paraplegia, paralysis, functional disability	0.2 (0.0)	0.1, 0.3	31.5	<.0001
Vascular disease and complications	0.0 (0.0)	0.0, 0.1	0.2	0.63
Cancer	0.2 (0.0)	0.1, 0.3	27.4	<.0001
Trauma; other injuries	0.1 (0.0)	0.1, 0.2	22.5	<.0001
Major psychiatric disorders	0.0 (0.0)	0.0, 0.1	0.9	0.34
Chronic Liver Disease	0.1 (0.1)	0.0, 0.3	2.6	0.10
Severe hematological disorders	0.4 (0.1)	0.3, 0.6	35.9	<.0001
Iron deficiency or other/unspecified anemias and blood disease	0.5 (0.0)	0.5, 0.6	517.0	<.0001
Depression	0.1 (0.0)	0.0, 0.1	4.6	0.03
Parkinson's and Huntington's diseases	0.2 (0.0)	0.1, 0.3	19.9	<.0001
Seizure disorders and convulsions	0.2 (0.0)	0.1, 0.3	17.1	<.0001
Fibrosis of lung or other chronic lung disorders	0.2 (0.0)	0.2, 0.3	53.0	<.0001
Asthma	0.0 (0.0)	-0.1, 0.1	0.0	0.87

Appendix Table 7. Propensity Score Models for Admission to a Major Teaching Hospital

Appendix Table 7a. AMI Propensity Score Model for Admission to a Major Teaching Hospital

The model was estimated on the AMI matching population (N=281,112), using binary logistic regression (c=0.77).

Variable	Estimate (SE)	Odds Ratio (95% CI)	Chi Sq	P
Intercept	-3.98 (0.17)	0.00 (0.00, 0.00)	547.5	<.0001
<i>Patient Demographics</i>				
Age (years)	0.00 (0.00)	1.00 (1.00, 1.01)	0.0	0.82
Age 65-69 (reference)	--	--	--	--
Age 70-74	-0.04 (0.02)	0.97 (0.92, 1.01)	2.7	0.10
Age 75-79	-0.05 (0.03)	0.95 (0.89, 1.01)	3.2	0.07
Age 80-84	-0.07 (0.04)	0.93 (0.86, 1.01)	3.0	0.08
Age 85+	-0.04 (0.06)	0.97 (0.86, 1.08)	0.4	0.53
Sex (male)	0.07 (0.01)	1.08 (1.05, 1.10)	39.8	<.0001
Race- White (reference)	--	--	--	--
Race- Black	1.24 (0.02)	3.47 (3.35, 3.59)	4,741.7	<.0001
Race- Hispanic	0.83 (0.02)	2.30 (2.19, 2.41)	1,124.2	<.0001
Race- Other	0.69 (0.03)	1.99 (1.88, 2.11)	529.7	<.0001
Year 2012 (reference)	--	--	--	--
Year 2013	0.00 (0.01)	1.00 (0.98, 1.03)	0.0	0.86
Year 2014	-0.01 (0.02)	0.99 (0.96, 1.02)	0.7	0.40
Emergent Type Admission	1.13 (0.02)	3.10 (3.00, 3.21)	4,575.5	<.0001
Treatment at another hospital's ED	0.74 (0.11)	2.09 (1.70, 2.57)	48.7	<.0001
Prior SNF Stay	-0.21 (0.11)	0.81 (0.66, 1.01)	3.6	0.06
Prior ASC Visit	-2.48 (0.26)	0.08 (0.05, 0.14)	89.1	<.0001
Prior Intermediate Care Stay	0.25 (0.22)	1.28 (0.83, 1.99)	1.2	0.27
Prior Dialysis Visit	-0.32 (0.08)	0.73 (0.62, 0.85)	15.4	<.0001
Region- South (Reference)	--	--	--	--
Region- Northeast	1.91 (0.02)	6.76 (6.55, 6.98)	14,017.9	<.0001
Region- Midwest	1.48 (0.02)	4.41 (4.26, 4.55)	7,734.2	<.0001
Region- Pacific	0.29 (0.03)	1.34 (1.28, 1.41)	131.9	<.0001
Region- Rockies	0.07 (0.04)	1.07 (1.00, 1.16)	3.6	0.06
<i>Principal Diagnoses</i>				
STEMI Type 1	0.10 (0.02)	1.11 (1.06, 1.15)	23.2	<.0001
STEMI Type 2	0.13 (0.02)	1.14 (1.10, 1.18)	58.6	<.0001
NSTEMI or unspecified MI (reference)	--	--	--	--
<i>Comorbidities</i>				
History of PTCA	0.09 (0.02)	1.09 (1.05, 1.14)	16.5	<.0001
History of CABG	-0.04 (0.02)	0.96 (0.92, 1.00)	3.2	0.07
Heart Failure	0.05 (0.02)	1.05 (1.02, 1.09)	11.5	0.00
Myocardial Infarction	-0.31 (0.02)	0.73 (0.71, 0.76)	265.4	<.0001
Unstable Angina	0.16 (0.02)	1.18 (1.14, 1.22)	80.2	<.0001
Cardio-respiratory Failure or Shock	-0.07 (0.02)	0.93 (0.89, 0.98)	9.2	0.00
Valvular Heart Disease	-0.06 (0.01)	0.94 (0.92, 0.97)	22.8	<.0001
Hypertension	0.00 (0.02)	1.00 (0.96, 1.04)	0.0	0.90
Stroke	0.04 (0.03)	1.04 (0.99, 1.10)	2.8	0.10
Cerebrovascular Disease	0.05 (0.02)	1.06 (1.02, 1.09)	10.8	0.00
Renal Failure	0.01 (0.02)	1.01 (0.98, 1.04)	0.2	0.69
COPD	-0.27 (0.01)	0.77 (0.75, 0.79)	383.4	<.0001
Pneumonia; pleural effusion/pneumothorax	0.01 (0.01)	1.01 (0.98, 1.04)	0.1	0.73
Diabetes	0.00 (0.01)	1.00 (0.98, 1.03)	0.1	0.71
Malnutrition	0.12 (0.03)	1.13 (1.07, 1.19)	22.9	<.0001
Dementia or other specified brain disorders	-0.07 (0.02)	0.93 (0.90, 0.96)	19.0	<.0001
Hemiplegia, paraplegia, paralysis, functional disability	-0.02 (0.03)	0.98 (0.93, 1.03)	0.8	0.37
Vascular disease and complications	0.15 (0.01)	1.16 (1.13, 1.20)	116.4	<.0001
Cancer	0.15 (0.03)	1.16 (1.09, 1.23)	25.6	<.0001
Trauma; other injuries	0.08 (0.01)	1.09 (1.06, 1.12)	38.5	<.0001

Variable	Estimate (SE)	Odds Ratio (95% CI)	Chi Sq	P
Major psychiatric disorders	0.02 (0.02)	1.02 (0.98, 1.07)	1.0	0.33
Chronic Liver Disease	0.31 (0.04)	1.36 (1.25, 1.48)	48.4	<.0001
Severe hematological disorders	0.04 (0.05)	1.05 (0.95, 1.16)	0.7	0.39
Iron deficiency or other/unspecified anemias and blood disease	0.12 (0.01)	1.12 (1.10, 1.15)	90.6	<.0001
Depression	0.01 (0.02)	1.02 (0.98, 1.05)	0.8	0.38
Parkinson's and Huntington's diseases	-0.02 (0.04)	0.98 (0.91, 1.06)	0.2	0.63
Seizure disorders and convulsions	0.05 (0.03)	1.05 (0.99, 1.11)	2.7	0.10
Fibrosis of lung or other chronic lung disorders	-0.10 (0.03)	0.91 (0.86, 0.96)	12.2	0.00
Asthma	0.20 (0.02)	1.22 (1.17, 1.28)	77.8	<.0001

Appendix Table 7b. HF Propensity Score Model for Admission to a Major Teaching Hospital

The model was estimated on the HF matching population (N=443,715), using binary logistic regression (c=0.66).

Variable	Estimate (SE)	Odds Ratio (95% CI)	Chi Sq	P
Intercept	-1.99 (0.11)	0.00 (0.00, 0.00)	323.6	<.0001
<i>Patient Demographics</i>				
Age (years)	0.00 (0.00)	1.00 (1.00, 1.01)	5.2	0.02
Age 65-69 (reference)	--	--	--	--
Age 70-74	-0.10 (0.02)	0.91 (0.88, 0.94)	33.6	<.0001
Age 75-79	-0.16 (0.02)	0.85 (0.81, 0.89)	59.0	<.0001
Age 80-84	-0.20 (0.03)	0.82 (0.78, 0.87)	51.5	<.0001
Age 85+	-0.17 (0.04)	0.85 (0.79, 0.91)	19.5	<.0001
Sex (male)	0.12 (0.01)	1.12 (1.11, 1.14)	198.2	<.0001
Race- White (reference)	--	--	--	--
Race- Black	0.95 (0.01)	2.57 (2.52, 2.63)	7,234.2	<.0001
Race- Hispanic	0.46 (0.02)	1.58 (1.52, 1.63)	646.7	<.0001
Race- Other	0.66 (0.02)	1.94 (1.86, 2.03)	822.3	<.0001
Year 2012 (reference)	--	--	--	--
Year 2013	-0.01 (0.01)	0.99 (0.97, 1.01)	1.7	0.20
Year 2014	-0.03 (0.01)	0.98 (0.96, 1.00)	6.2	0.01
Emergent Type Admission	0.53 (0.01)	1.70 (1.67, 1.74)	2,529.7	<.0001
Treatment at another hospital's ED	0.40 (0.29)	1.49 (0.85, 2.62)	1.9	0.17
Prior SNF Stay	-0.35 (0.07)	0.71 (0.62, 0.81)	27.3	<.0001
Prior ASC Visit	-1.95 (0.18)	0.14 (0.10, 0.20)	123.8	<.0001
Prior Intermediate Care Stay	0.31 (0.14)	1.37 (1.04, 1.81)	4.9	0.03
Prior Dialysis Visit	-0.33 (0.06)	0.72 (0.65, 0.81)	33.2	<.0001
Region- South or Northeast (Reference)	--	--	--	--
Region- Midwest	0.43 (0.01)	1.54 (1.51, 1.57)	2,365.0	<.0001
Region- Pacific	-0.77 (0.02)	0.46 (0.45, 0.48)	2,018.0	<.0001
Region- Rockies	-0.90 (0.03)	0.41 (0.39, 0.43)	949.9	<.0001
<i>Principal Diagnoses</i>				
HF with Hypertension	-0.24 (0.03)	0.79 (0.74, 0.84)	66.0	<.0001
HF with Chronic Kidney Disease	-0.24 (0.02)	0.79 (0.76, 0.82)	201.8	<.0001
HF, other (reference)	--	--	--	--
<i>Comorbidities</i>				
History of PTCA	0.01 (0.01)	1.01 (0.98, 1.04)	0.5	0.48
History of CABG	-0.06 (0.01)	0.94 (0.92, 0.96)	24.3	<.0001
Heart Failure	0.19 (0.01)	1.21 (1.19, 1.23)	424.6	<.0001
Myocardial Infarction	-0.04 (0.02)	0.96 (0.91, 1.00)	3.2	0.07
Unstable Angina	0.29 (0.02)	1.34 (1.30, 1.38)	322.1	<.0001
Cardio-respiratory Failure or Shock	-0.05 (0.01)	0.95 (0.93, 0.97)	20.5	<.0001
Valvular Heart Disease	0.02 (0.01)	1.03 (1.01, 1.04)	8.9	0.00
Hypertension	-0.10 (0.02)	0.90 (0.88, 0.93)	46.3	<.0001
Stroke	0.13 (0.02)	1.14 (1.10, 1.17)	66.6	<.0001
Cerebrovascular Disease	-0.05 (0.01)	0.95 (0.93, 0.97)	18.2	<.0001
Renal Failure	-0.03 (0.01)	0.97 (0.96, 0.99)	8.8	0.00
COPD	-0.31 (0.01)	0.74 (0.72, 0.75)	1,329.4	<.0001
Pneumonia; pleural effusion/pneumothorax	-0.10 (0.01)	0.91 (0.89, 0.92)	137.5	<.0001
Diabetes	-0.02 (0.01)	0.98 (0.96, 0.99)	7.3	0.01
Malnutrition	-0.02 (0.01)	0.98 (0.95, 1.01)	2.2	0.13
Dementia or other specified brain disorders	-0.13 (0.01)	0.88 (0.86, 0.90)	151.8	<.0001
Hemiplegia, paraplegia, paralysis, functional disability	-0.08 (0.02)	0.93 (0.90, 0.96)	21.0	<.0001
Vascular disease and complications	0.20 (0.01)	1.22 (1.20, 1.24)	511.0	<.0001
Cancer	0.21 (0.02)	1.23 (1.18, 1.28)	116.3	<.0001
Trauma; other injuries	0.04 (0.01)	1.04 (1.02, 1.06)	16.7	<.0001
Major psychiatric disorders	0.00 (0.01)	1.00 (0.97, 1.03)	0.0	0.94
Chronic Liver Disease	0.30 (0.02)	1.35 (1.29, 1.41)	184.9	<.0001
Severe hematological disorders	0.11 (0.03)	1.12 (1.07, 1.18)	18.9	<.0001

Variable	Estimate (SE)	Odds Ratio (95% CI)	Chi Sq	P
Iron deficiency or other/unspecified anemias and blood disease	0.04 (0.01)	1.04 (1.02, 1.06)	18.4	<.0001
Depression	0.07 (0.01)	1.07 (1.05, 1.09)	41.0	<.0001
Parkinson's and Huntington's diseases	-0.04 (0.03)	0.96 (0.91, 1.02)	2.0	0.16
Seizure disorders and convulsions	0.05 (0.02)	1.05 (1.01, 1.09)	5.1	0.02
Fibrosis of lung or other chronic lung disorders	-0.06 (0.02)	0.94 (0.92, 0.97)	15.8	<.0001
Asthma	0.20 (0.01)	1.22 (1.19, 1.25)	210.1	<.0001
Intercept	-1.99 (0.11)	0.00 (0.00, 0.00)	323.6	<.0001

Appendix Table 7c. PNA Risk Model for Predicted Cost The model was estimated on the PNA matching population (N=528,133), using logistic regression (c=0.67).

Variable	Odds Ratio		Chi Sq	P
	Estimate (SE)	(95% CI)		
Intercept	-3.04 (0.11)	0.00 (0.00, 0.00)	777.4	<.0001
<i>Patient Demographics</i>				
Age (years)	0.01 (0.00)	1.01 (1.01, 1.01)	31.0	<.0001
Age 65-69 (reference)	--	--	--	--
Age 70-74	-0.09 (0.02)	0.91 (0.88, 0.94)	28.6	<.0001
Age 75-79	-0.18 (0.02)	0.84 (0.80, 0.87)	67.9	<.0001
Age 80-84	-0.18 (0.03)	0.84 (0.79, 0.88)	42.8	<.0001
Age 85+	-0.14 (0.04)	0.87 (0.81, 0.93)	14.4	0.00
Sex (male)	0.06 (0.01)	1.07 (1.05, 1.08)	55.7	<.0001
Race- White (reference)	--	--	--	--
Race- Black	0.92 (0.01)	2.52 (2.46, 2.58)	5,184.3	<.0001
Race- Hispanic	0.58 (0.02)	1.79 (1.73, 1.86)	1,120.8	<.0001
Race- Other	0.75 (0.02)	2.12 (2.03, 2.21)	1,217.2	<.0001
Year 2012 (reference)	--	--	--	--
Year 2013	-0.02 (0.01)	0.98 (0.96, 1.00)	4.9	0.03
Year 2014	-0.05 (0.01)	0.96 (0.94, 0.98)	17.5	<.0001
Emergent Type Admission	0.91 (0.01)	2.48 (2.42, 2.54)	4,806.4	<.0001
Treatment at another hospital's ED	0.25 (0.31)	1.28 (0.70, 2.34)	0.6	0.42
Prior SNF Stay	-0.15 (0.04)	0.86 (0.79, 0.94)	11.9	0.00
Prior ASC Visit	-2.00 (0.23)	0.14 (0.09, 0.21)	78.5	<.0001
Prior Intermediate Care Stay	0.09 (0.16)	1.10 (0.81, 1.49)	0.4	0.55
Prior Dialysis Visit	-0.35 (0.06)	0.71 (0.63, 0.79)	40.0	<.0001
Region- South or Northeast (Reference)				
Region- Midwest	0.36 (0.01)	1.43 (1.40, 1.45)	1,482.2	<.0001
Region- Pacific	-0.71 (0.02)	0.49 (0.48, 0.51)	1,726.0	<.0001
Region- Rockies	-1.17 (0.03)	0.31 (0.29, 0.33)	1,452.8	<.0001
<i>Principal Diagnoses</i>				
Pneumonia due to anaerobe or GN bacteria	0.07 (0.03)	1.08 (1.02, 1.13)	7.7	0.01
Haemophilus Influenza pneumonia	-0.03 (0.08)	0.97 (0.83, 1.14)	0.1	0.73
Pneumonia due to Legionnaires' disease	1.05 (0.09)	2.85 (2.39, 3.40)	135.9	<.0001
Pneumonia due to MRSA	-0.12 (0.03)	0.89 (0.83, 0.95)	11.7	0.00
Pneumonia, other	-0.10 (0.01)	0.90 (0.88, 0.92)	85.7	<.0001
Pneumococcal pneumonia	0.12 (0.04)	1.13 (1.04, 1.23)	8.8	0.00
Pneumonia due to Pseudomonas	0.13 (0.04)	1.14 (1.06, 1.23)	12.2	0.00
Pneumonia due to Streptococcus	-0.02 (0.07)	0.98 (0.85, 1.13)	0.1	0.75
Pneumonia due to Staphylococcus	-0.06 (0.13)	0.94 (0.74, 1.21)	0.2	0.65
Aspiration pneumonia (reference)	0	0	0	0.00
<i>Comorbidities</i>				
History of PTCA	-0.04 (0.02)	0.96 (0.92, 0.99)	5.2	0.02
History of CABG	-0.14 (0.02)	0.87 (0.84, 0.90)	59.0	<.0001
Heart Failure	0.06 (0.01)	1.07 (1.05, 1.09)	42.7	<.0001
Myocardial Infarction	-0.05 (0.03)	0.95 (0.89, 1.01)	2.6	0.11
Unstable Angina	0.34 (0.02)	1.40 (1.35, 1.46)	247.3	<.0001
Cardio-respiratory Failure or Shock	-0.03 (0.01)	0.97 (0.95, 0.99)	7.2	0.01
Valvular Heart Disease	0.02 (0.01)	1.02 (1.00, 1.04)	3.9	0.05
Hypertension	-0.07 (0.01)	0.93 (0.91, 0.96)	32.0	<.0001
Stroke	0.04 (0.01)	1.05 (1.02, 1.08)	8.9	0.00
Cerebrovascular Disease	-0.03 (0.01)	0.97 (0.95, 1.00)	5.9	0.01
Renal Failure	0.05 (0.01)	1.05 (1.03, 1.07)	22.2	<.0001
COPD	-0.35 (0.01)	0.70 (0.69, 0.72)	1,632.9	<.0001
Pneumonia; pleural effusion/pneumothorax	-0.22 (0.01)	0.81 (0.79, 0.82)	433.6	<.0001
Diabetes	-0.03 (0.01)	0.97 (0.96, 0.99)	9.3	0.00
Malnutrition	0.00 (0.01)	1.00 (0.98, 1.02)	0.0	0.94
Dementia or other specified brain disorders	-0.09 (0.01)	0.91 (0.89, 0.93)	89.4	<.0001

Variable	Estimate (SE)	Odds Ratio (95% CI)	Chi Sq	P
Hemiplegia, paraplegia, paralysis, functional disability	0.02 (0.01)	1.02 (0.99, 1.05)	2.3	0.13
Vascular disease and complications	0.22 (0.01)	1.24 (1.22, 1.27)	577.6	<.0001
Cancer	0.36 (0.01)	1.43 (1.39, 1.46)	711.4	<.0001
Trauma; other injuries	0.06 (0.01)	1.06 (1.04, 1.08)	41.5	<.0001
Major psychiatric disorders	0.01 (0.01)	1.01 (0.99, 1.04)	1.4	0.23
Chronic Liver Disease	0.27 (0.03)	1.31 (1.25, 1.38)	110.7	<.0001
Severe hematological disorders	0.20 (0.03)	1.22 (1.16, 1.28)	55.3	<.0001
Iron deficiency or other/unspecified anemias and blood disease	0.04 (0.01)	1.04 (1.02, 1.06)	17.2	<.0001
Depression	0.09 (0.01)	1.10 (1.08, 1.12)	89.6	<.0001
Parkinson's and Huntington's diseases	0.04 (0.02)	1.04 (1.00, 1.08)	4.0	0.05
Seizure disorders and convulsions	0.09 (0.02)	1.10 (1.07, 1.13)	34.7	<.0001
Fibrosis of lung or other chronic lung disorders	0.01 (0.01)	1.02 (0.99, 1.04)	1.4	0.24
Asthma	0.21 (0.01)	1.23 (1.20, 1.26)	262.7	<.0001

Appendix Table 8. Definitions of Resource Utilization-based Costs and Payments

We defined costs by resource utilization.^{14, 30, 31} The algorithm is as follows:

A. Exclusions for Non-Acute Care

1. Inpatient Hospital (Part A) File
 - a. Exclude claim for hospitalizations in non-acute settings using 6-digit Medicare hospital ID (hospital identified as other than “Short-term (General and Specialty) Hospital” or “Critical Access Hospital”)
 - i. Exclude if the 3rd position of the ID is not equal to “0” or if the 3rd and 4th positions are not equal to “13”
 - ii. Exclude if 4th, 5th, or 6th position in identifier is not a number
 - b. Exclude claim if DRG = 945 or 946 (Rehabilitation)
2. Outpatient File
 - a. Exclude claim for encounters in non-acute settings using 6-digit Medicare hospital ID (hospital identified as other than “Short-term (General and Specialty) Hospital” or “Critical Access Hospital”)
 - i. Exclude if the 3rd position of the ID is not equal to “0” or if the 3rd and 4th positions are not equal to “13”
 - ii. Exclude if 4th, 5th, or 6th position in identifier is not a number
 - b. Exclude claim if principal diagnosis = V57 or subterms (Care involving use of rehabilitation procedures)
3. Physician/Carrier (Part B) File
 - a. Exclude any claim if the from and through dates fall on or between the admission and discharge dates of a non-acute hospitalization (as defined above) or between the from and through dates of a claim for outpatient care in a non-acute hospital
 - b. Exclude claim if no line item place of service codes from the following list appear:

11 = Office	15 = Mobile Unit
20 = Urgent Care Facility	21 = Inpatient hospital
22 = Outpatient hospital	23 = Emergency room - hospital
24 = Ambulatory surgical center	41 = Ambulance - land
42 = Ambulance - air or water	50 = Federally qualified health centers
65 = End stage renal disease treatment facility	71 = State or local public health clinic
81 = Independent laboratory	
 - c. Exclude claim if principal diagnosis = V57 or subterms (Care involving use of rehabilitation procedures)

B. Resource Utilization-Based Cost Accounting

1. Facility and Accommodation Costs from the Inpatient File:

- a. Accommodations:
 - i. Determine number of inpatient critical care and non-critical care days from revenue centers in the Inpatient file.
 - ii. Multiply number of critical care/intermediate care/non-critical care days by average daily cost for each type (adjust to 2014 values using the Bureau of Labor & Statistics inflation factor, hospital component - CCM: \$4,738.58; IC: \$3,145.81; Non-CCM: \$1,553.04)

Revenue Centers for:		
Non-Critical Care	Intermediate Care	Critical Care
0100-0101 All-inclusive rate-room and board	0206, 0214 Intermediate Care	0200-0205 Intensive care
0110-0119 Private medical or general		0207-0209 Intensive Care
0120-0129 Semi-private 2 bed (medical or general)		0210-0213, 0219 Coronary care
0130-0139 Semi-private 3 and 4 beds		
0140-0149 Private (deluxe)		
0150-0159 Room & Board ward (medical or general)		
0160, 0164, 0167, 0169 Other Room & Board		

- b. Operating Room Time Cost (index admission only)
 - i. Determine operating room time using “best anesthesia chart time,” if available; If best anesthesia time missing, use claim anesthesia time from Physician/Carrier (Part B) file; if both best chart time and claim time missing, assign each patient median best anesthesia time by procedure
 - ii. Multiply anesthesia time by mean of OR time cost range and inflate to 2014 dollars (\$24.29/minute)

- c. Emergency Room Visit Fixed Costs (post-discharge only)
 - i. For post-discharge Part B records only, separate records into line items and locate place of service code 23 (“Emergency Room – Hospital”)
 - ii. Treat each unique ER date as separate visit, sum visits per patient
 - d. Multiply by average ER visit cost, inflated to 2014 dollars (\$593.55)
- 2. Service Costs from Carrier/Part B and Outpatient Files: (Note: Office visits, Home Care, SNF, and non-ER Outpatient use only section 2 methods)**
- a. Separate line items from Part B (each includes patient ID, CPT code, units count, place of service)
 - b. Anesthesia - if first two digits of CPT code are 00 or 01, code indicates anesthesia billing
 - i. Apply standard CMS base units (2014 list) to each CPT code; if applicable, anesthesia modifier AD reduces base units to 3 per procedure for medical supervision
 - ii. Since time units count reflects anesthesia time in minutes divided by 1.5, divide reported time by 10 to determine number of 15-minute anesthesia time units
 - iii. Add base and time units for each line item, multiply by \$22.68 (un-weighted mean of locality conversion factors, number needs to be revised once national CF available); If applicable, anesthesia modifier QK reduces total AVUs by 50% of allowed rate for medical direction of multiple procedures
 - iv. Sum anesthesia line item costs by patient
 - c. Other Services - apply method to all non-anesthesia Part B line items
 - i. Merge line item CPT with AMA CPT/RVU list (2014 file) to determine RVU for each
 - ii. Using place of service codes, determine whether facility or non-facility RVU is appropriate – for this cost estimate, treat outpatient hospitals as “non-facility” sites of care to adjust for facility component of service costs
 - iii. Multiply RVUs by line item service count (=1 in 99% of non-anesthesia cases)
 - iv. Multiply total RVUs by conversion factor (\$35.82 in 2014)
 - v. Sum line item costs by patient
- 3. Time Frame Under Assessment for Resource Utilization-based Cost Accounting:**
- a. In-hospital costs account for all patient claims during the time period of the index hospitalization
 - b. 30-day costs account for all in-hospital costs, plus any other bills (ER visits, and any bills in the Outpatient and Carrier/Part B files) that occurred within 30 days of admission, and any bills accrued during the entirety of any readmission that began within 30 days of admission.

4. Summary Equation:

$$C_{i,30} = (D_{inp}^{CC} * 4,738.58 + D_{inp}^{IC} * 3,145.81 + D_{inp}^{NCC} * 1,553.04) + (T_{OR} * 24.29) + AU * 22.68 + ER * 593.55 + \sum RVU_j * 35.82 + RC$$

D_{inp}^{CC} = Number of days in critical care

D_{inp}^{IC} = Number of days in intermediate care

D_{inp}^{NCC} = Number of days on hospital floor

T_{OR} = Number of minutes in operating room

AU = Number of anesthesia units

ER = Number of emergency room days

RVU_j = Number of all j RVUs from all bills over defined time period that includes all outpatient and office visits

RC = Readmission costs—all costs associated with hospitalization that began within 30 days of readmission

C. Payments Calculation Steps

Inpatient Hospital (Part A) File

- Components
 - Payment Made by Medicare: Claim Payment Amount (SAS alias: CLM_PMT_AMT) + (Claim Pass Through Per Diem Amount for Pass-Through Expenses such as capital costs, DME costs, kidney acquisition costs, and bad debts [SAS alias: CLM_PASS_THRU_PER_DIEM_AMT] * Claim Utilization Day Count (SAS alias: CLM_UTLZTN_DAY_CNT))
 - Payment Made by Beneficiary: NCH Beneficiary Inpatient Deductible Amount (SAS alias: NCH_BENE_IP_DDCTBL_AMT) + NCH Beneficiary Part A Coinsurance Liability Amount (SAS alias: NCH_BENE_PTA_COINSRNC_LBLTY_AM) + NCH Beneficiary Blood Deductible Liability Amount (SAS alias: NCH_BENE_BLOOD_DDCTBL_LBLTY_AM)

- Payment Made by Primary Payer (non-Medicare): NCH Primary Payer Claim Paid Amount (SAS alias: NCH_PRMRY_PYR_CLM_PD_AMT)
- Inpatient Payment = CLM_PMT_AMT + (CLM_PASS_THRU_PER_DIEM_AMT * CLM_UTLZTN_DAY_CNT) + NCH_BENE_IP_DDCTBL_AMT + NCH_BENE_PTA_COINSRNC_LBLTY_AM + NCH_BENE_BLOOD_DDCTBL_LBLTY_AM + NCH_PRMRY_PYR_CLM_PD_AMT

Outpatient File

- Components
 - Payment Made by Medicare: Claim Payment Amount (SAS alias: CLM_PMT_AMT)
 - Payment Made by Beneficiary: NCH Beneficiary Part B Coinsurance Liability Amount (SAS alias: NCH_BENE_PTB_COINSRNC_AMT) + NCH Beneficiary Part B Deductible Amount (SAS alias: NCH_BENE_PTB_DDCTBL_AMT) + NCH Beneficiary Blood Deductible Liability Amount (SAS alias: NCH_BENE_BLOOD_DDCTBL_LBLTY_AM)
 - Payment Made by Primary Payer (non-Medicare): NCH Primary Payer Claim Paid Amount (SAS alias: NCH_PRMRY_PYR_CLM_PD_AMT)
- Outpatient Payment = CLM_PMT_AMT + NCH_BENE_PTB_COINSRNC_AMT + NCH_BENE_PTB_DDCTBL_AMT + NCH_BENE_BLOOD_DDCTBL_LBLTY_AM + NCH_PRMRY_PYR_CLM_PD_AMT

Physician/Carrier (Part B) Line File

- Components
 - Payment Made by Medicare: Claim Payment Amount (SAS alias: CLM_PMT_AMT)
 - Payment Made by Beneficiary: Carrier Claim Cash Deductible Applied Amount (SAS alias: CARR_CLM_CASH_DDCTBL_APLD_AMT) + SUM of Line Coinsurance Amount (SAS alias: LINE_COINSRNC_AMT)
 - Payment Made by Primary Payer (non-Medicare): Carrier Claim Payer Paid Amount (SAS alias: CARR_CLM_PRMRY_PYR_PD_AMT)
- Part B Payment = CLM_PMT_AMT + CARR_CLM_CASH_DDCTBL_APLD_AMT + LINE_COINSRNC_AMT + CARR_CLM_PRMRY_PYR_PD_AMT

Basic Total Payments

- Merge together the IP, OP, and PB payment amounts for each patient and sum all items.
- Inflate payments to 2014 dollars.

Payments without Geographic Adjustment: to avoid punishing hospitals located in high-cost areas and or reward hospitals for being in low-cost areas.

Part A Adjustment:

- Assign the geographic adjustment to each hospital
 - Find Geographic Adjustment Factors (GAF) for 2012-2014 by Medicare locality⁴⁹⁻⁵¹
 - Assign a GAF to each census based statistical area (CBSA), based on the Medicare locality number, and then assign GAF's to hospitals based on the hospital's CBSA
 - Hospitals not linked to CBSAs are assigned their state's "Rest of State" GAF
- Identify the Operating Labor Base Payment, Operating Non-labor Base Payment, and Capital Base Payment using the relevant year's CMS Final Rule.
 - Identify the Wage Index for each hospital
 - Find the Wage Indices by CBSA for 2012-2014 using the year's CMS Final Rule.
 - Assign each hospital the wage index of their geographic CBSA or their reclassified CBSA, if applicable.
 - Identify the Quality Indicator for each hospital for 2012-2014 using the CMS Provider Specific File.⁵²
 - Use the year and hospital-specific assigned Wage Index and Quality indicator to determine the Base Operating Labor, Base Operating Non-Labor, and Base Capital Payment Amounts
- Apply the geographic adjustment to each patient's operating labor base payments
 - Geographically-unadjusted inpatient payments are calculated as total payments + [(1-GAF) * Base Operating Labor Amount * DRG Weight] + {[(1/GAF)-1] * Total Capital Payment Amount}

Part B Adjustment:

- Identify all of the CPT and HCPCS codes on the Part B/Carrier bill
- Find the Work RVU, Practice Expense (PE) RVU, and Malpractice (MP) RVU for each CPT/HCPCS code billed.⁵³
- Identify the Work Geographic Practice Cost Index (GPCI), PE GPCI, and MP GPCI that corresponds to the provider's state and carrier number on the claim.
- Identify the yearly Conversion Factor (CF) of RVUs to dollars.
- Make the adjustment and inflate to 2015 dollars.
- The Part B payment without geographic adjustment is

$$= \text{Total Part B Payment} + CF * [\sum RVUs_{Work}(1 - GPCI_{Work}) + \sum RVUs_{PE}(1 - GPCI_{PE}) + \sum RVUs_{MP}(1 - GPCI_{MP})]$$

Payments without Indirect Medical Education Component: to avoid punishing hospitals participating in graduate medical education.

- Subtract from the Inpatient Payment the Claim PPS Capital Indirect Medical Education (IME) Amount (SAS Alias: CLM_PPS_CPTL_IME_AMT) and the Operating Indirect Medical Education (IME) Amount (SAS Alias: IME_OP_CLM_VAL_AMT).

$$\text{Payment without IME} = \text{Total Payment} - (\text{CLM_PPS_CPTL_IME_AMT} + \text{IME_OP_CLM_VAL_AMT})$$

Payments without Geography Adjustment or IME

$$\begin{aligned} \text{Payments without Geo or IME} = & \text{Total Payment} + [(1 - GAF) * \text{CLM_BASE_OPRTG_DRG_AMT} * \\ & \text{CLM_PPS_CPTL_DRG_WT_NUM}] + \{[(1/GAF) - 1] * \text{CLM_TOT_PPS_CPTL_AMT}\} - [(1/GAF) * \\ & \text{CLM_PPS_CPTL_IME_AMT}] - \text{IME_OP_CLM_VAL_AMT} + CF * [\sum RVUs_{Work}(1 - GPCI_{Work}) + \sum RVUs_{PE}(1 - GPCI_{PE}) + \\ & \sum RVUs_{MP}(1 - GPCI_{MP})] \end{aligned}$$

Payments without Disproportionate Share Hospital (DSH): removes the CMS payments made to Disproportionate Share Hospitals for high rates of Medicaid or indigent care.

- Subtract from the Inpatient Payment the operating DSH payment (DSH_OP) and capital DSH Payment (SAS Alias: DSP_SHR)

$$\text{Payments without DSH} = \text{Total Payment} - (\text{DSH_OP_CLM_VAL_AMT} + \text{CLM_PPS_CPTL_DSPRPRTNT_SHR_AMT})$$

Payments without Geography Adjustment or DSH

$$\begin{aligned} \text{Payments without Geo or DSH} = & \text{Total Payment} + [(1 - GAF) * \text{CLM_BASE_OPRTG_DRG_AMT} * \\ & \text{CLM_PPS_CPTL_DRG_WT_NUM}] + \{[(1/GAF) - 1] * \text{CLM_TOT_PPS_CPTL_AMT}\} - [(1/GAF) * \\ & \text{CLM_PPS_CPTL_DSPRPRTNT_SHR_AMT}] - \text{DSH_OP_CLM_VAL_AMT} + CF * [\sum RVUs_{Work}(1 - GPCI_{Work}) + \\ & \sum RVUs_{PE}(1 - GPCI_{PE}) + \sum RVUs_{MP}(1 - GPCI_{MP})] \end{aligned}$$

Payments without Geo, IME or DSH

$$\begin{aligned} = & \text{Total Payment} + \left[(1 - GAF) * \text{CLM}_{\text{BASEOPRTGDRGAMT}} * \text{CLM}_{\text{PPSCPTLDRGWTNUM}} \right] \\ & + \left\{ \left[\left(\frac{1}{GAF} \right) - 1 \right] * \text{CLM}_{\text{TOTPPSCPTLAMT}} \right\} - \left[\left(\frac{1}{GAF} \right) * \left(\text{CLM}_{\text{PPSCPTLIMEAMT}} + \text{CLM}_{\text{PPSCPTLDSRPRTNTSHRAMT}} \right) \right] \\ & - \left(\text{IME}_{\text{OPCLMVALAMT}} + \text{DSH}_{\text{OPCLMVALAMT}} \right) + CF \\ & * \left[\sum RVUs_{Work}(1 - GPCI_{Work}) + \sum RVUs_{PE}(1 - GPCI_{PE}) + \sum RVUs_{MP}(1 - GPCI_{MP}) \right] \end{aligned}$$

Appendix Table 9. Complete Matching Table for Combined Medical Conditions The table below reports balance before and after matching between patients admitted to major teaching or non-teaching hospitals for AMI, HF, and Pneumonia. All covariates met balance criteria.

Variable	All Major Teaching Cases N=203,922	Matched Major Teaching Cases N=203,922	Matched Non-Teaching Controls N=203,922	All Non-Teaching Controls N=1,049,037	Std. Diff Before Match	P-value Before Match	Std. Diff After Match	P-value After Match
Number of Hospitals	339	339	2,439	2,533				
Demographics								
Sex (% male)	97,360 (47.74%)	97,360 (47.74%)	98,039 (48.08%)	498,002 (47.47%)	0.01	0.0248	-0.01	0.0336
Age (mean)	80.1	80.1	80.1	80.1	0.00	0.0693	0.00	0.0289
Age 65-69	29,483 (14.46%)	29,483 (14.46%)	28,837 (14.14%)	139,579 (13.31%)	0.03	<.0001	0.01	0.0039
Age 70-74	32,703 (16.04%)	32,703 (16.04%)	32,414 (15.90%)	169,136 (16.12%)	0.00	0.3348	0.00	0.2183
Age 75-79	34,018 (16.68%)	34,018 (16.68%)	34,114 (16.73%)	183,774 (17.52%)	-0.02	<.0001	0.00	0.6901
Age 80-84	37,466 (18.37%)	37,466 (18.37%)	38,289 (18.78%)	203,036 (19.35%)	-0.03	<.0001	-0.01	0.0009
Age 85+	70,252 (34.45%)	70,252 (34.45%)	70,268 (34.46%)	353,512 (33.70%)	0.02	<.0001	0.00	0.9606
Year (mean)	2013.1	2013.1	2013.1	2013.1	-0.01	<.0001	0.00	0.8572
Year 2012	50,501 (24.76%)	50,501 (24.76%)	49,908 (24.47%)	253,782 (24.19%)	0.01	<.0001	0.01	0.0314
Year 2013	85,944 (42.15%)	85,944 (42.15%)	86,982 (42.65%)	444,735 (42.39%)	-0.01	0.0374	-0.01	0.0010
Year 2014	67,477 (33.09%)	67,477 (33.09%)	67,032 (32.87%)	350,520 (33.41%)	-0.01	0.0045	0.00	0.1392
Race- non-Hispanic White	148,135 (72.64%)	148,135 (72.64%)	152,953 (75.01%)	893,590 (85.18%)	-0.31	<.0001	-0.06	<.0001
Race- Black	35,907 (17.61%)	35,907 (17.61%)	32,672 (16.02%)	74,891 (7.14%)	0.32	<.0001	0.05	<.0001
Race- Hispanic	12,126 (5.95%)	12,126 (5.95%)	10,320 (5.06%)	49,904 (4.76%)	0.05	<.0001	0.04	<.0001
Race- Other	7,754 (3.80%)	7,754 (3.80%)	7,977 (3.91%)	30,652 (2.92%)	0.05	<.0001	-0.01	0.0710
Emergent type admission	178,803 (87.68%)	178,803 (87.68%)	177,481 (87.03%)	792,212 (75.52%)	0.32	<.0001	0.02	<.0001
Treatment at another hospital's ED	150 (0.07%)	150 (0.07%)	143 (0.07%)	872 (0.08%)	0.00	0.1749	0.00	0.7259
Prior care at SNF	1,059 (0.52%)	1,059 (0.52%)	1,252 (0.61%)	6,141 (0.59%)	-0.01	0.0003	-0.01	0.0001
Prior care at ASC	189 (0.09%)	189 (0.09%)	187 (0.09%)	8,669 (0.83%)	-0.11	<.0001	0.00	0.9589
Prior intermediate care facility visit	352 (0.17%)	352 (0.17%)	292 (0.14%)	9,661 (0.92%)	-0.10	<.0001	0.00	0.0199
Prior dialysis visit	1,154 (0.57%)	1,154 (0.57%)	1,058 (0.52%)	7,772 (0.74%)	-0.02	<.0001	0.01	0.0428
Region Northeast	99,972 (49.02%)	99,972 (49.02%)	99,598 (48.84%)	214,946 (20.49%)	0.63	<.0001	0.00	0.2426
Region Midwest	62,029 (30.42%)	62,029 (30.42%)	60,560 (29.70%)	234,676 (22.37%)	0.18	<.0001	0.02	<.0001
Region Pacific	11,318 (5.55%)	11,318 (5.55%)	12,310 (6.04%)	117,693 (11.22%)	-0.21	<.0001	-0.02	<.0001
Region South	27,173 (13.33%)	27,173 (13.33%)	28,035 (13.75%)	428,109 (40.81%)	-0.65	<.0001	-0.01	0.0001
Region Rockies	3,430 (1.68%)	3,430 (1.68%)	3,419 (1.68%)	53,613 (5.11%)	-0.19	<.0001	0.00	0.9030
Admission Conditions								
STEMI Type 1	3,557 (1.74%)	3,557 (1.74%)	3,557 (1.74%)	18,771 (1.79%)	0.00	0.1617	0.00	1.0000
STEMI Type 2	5,576 (2.73%)	5,576 (2.73%)	5,576 (2.73%)	28,931 (2.76%)	0.00	0.5591	0.00	1.0000
NSTEMI or unspecified MI	34,857 (17.09%)	34,857 (17.09%)	34,857 (17.09%)	189,420 (18.06%)	-0.03	<.0001	0.00	1.0000

Variable	All Major Teaching Cases N=203,922	Matched Major Teaching Cases N=203,922	Matched Non-Teaching Controls N=203,922	All Non-Teaching Controls N=1,049,037	Std. Diff Before Match	P-value Before Match	Std. Diff After Match	P-value After Match
Pneumonia Due to Anaerobes or Gram-Negative Bacteria	2,155 (1.06%)	2,155 (1.06%)	2,155 (1.06%)	11,129 (1.06%)	0.00	0.8779	0.00	1.0000
Aspiration Pneumonia	14,909 (7.31%)	14,909 (7.31%)	14,909 (7.31%)	79,901 (7.62%)	-0.01	<.0001	0.00	1.0000
Pneumonia Due to H. Influenza	176 (0.09%)	176 (0.09%)	176 (0.09%)	1,297 (0.12%)	-0.01	<.0001	0.00	1.0000
Legionnaire's Disease	206 (0.10%)	206 (0.10%)	206 (0.10%)	403 (0.04%)	0.02	<.0001	0.00	1.0000
Pneumonia Due to MRSA	1,148 (0.56%)	1,148 (0.56%)	1,148 (0.56%)	8,121 (0.77%)	-0.03	<.0001	0.00	1.0000
Pneumonia, Other	51,556 (25.28%)	51,556 (25.28%)	51,556 (25.28%)	331,408 (31.59%)	-0.14	<.0001	0.00	1.0000
Pneumococcal Pneumonia	774 (0.38%)	774 (0.38%)	774 (0.38%)	4,280 (0.41%)	0.00	<.0001	0.00	1.0000
Pneumonia Due to Pseudomonas	918 (0.45%)	918 (0.45%)	918 (0.45%)	5,405 (0.52%)	-0.01	<.0001	0.00	1.0000
Streptococcal Pneumoniae	233 (0.11%)	233 (0.11%)	233 (0.11%)	1,427 (0.14%)	-0.01	0.0126	0.00	1.0000
Staphylococcal Pneumonia	75 (0.04%)	75 (0.04%)	75 (0.04%)	498 (0.05%)	-0.01	0.0414	0.00	1.0000
Viral Pneumonia	2,797 (1.37%)	2,797 (1.37%)	2,797 (1.37%)	9,317 (0.89%)	0.05	<.0001	0.00	1.0000
HF with Chronic Kidney Disease	5,773 (2.83%)	5,773 (2.83%)	5,773 (2.83%)	17,169 (1.64%)	0.08	<.0001	0.00	1.0000
HF with Hypertension	2,270 (1.11%)	2,270 (1.11%)	2,270 (1.11%)	9,111 (0.87%)	0.02	<.0001	0.00	1.0000
HF, Other	76,942 (37.73%)	76,942 (37.73%)	76,942 (37.73%)	332,449 (31.69%)	0.13	<.0001	0.00	1.0000
Comorbidities								
History of PTCA	15,037 (7.37%)	15,037 (7.37%)	15,630 (7.66%)	71,834 (6.85%)	0.02	<.0001	-0.01	0.0004
History of CABG	18,169 (8.91%)	18,169 (8.91%)	18,996 (9.32%)	92,729 (8.84%)	0.00	0.3066	-0.01	<.0001
Heart Failure	91,059 (44.65%)	91,059 (44.65%)	91,103 (44.68%)	415,580 (39.62%)	0.10	<.0001	0.00	0.8923
Myocardial Infarction	9,107 (4.47%)	9,107 (4.47%)	8,571 (4.20%)	52,009 (4.96%)	-0.02	<.0001	0.01	<.0001
Unstable Angina	16,589 (8.13%)	16,589 (8.13%)	15,588 (7.64%)	69,694 (6.64%)	0.06	<.0001	0.02	<.0001
Cardio-respiratory Failure or Shock	31,888 (15.64%)	31,888 (15.64%)	32,240 (15.81%)	173,453 (16.53%)	-0.02	<.0001	0.00	0.1311
Valvular Heart Disease	73,567 (36.08%)	73,567 (36.08%)	74,879 (36.72%)	355,548 (33.89%)	0.05	<.0001	-0.01	<.0001
Hypertension	183,257 (89.87%)	183,257 (89.87%)	182,069 (89.28%)	934,814 (89.11%)	0.02	<.0001	0.02	<.0001
Stroke	18,637 (9.14%)	18,637 (9.14%)	18,218 (8.93%)	82,449 (7.86%)	0.05	<.0001	0.01	0.0224
Cerebrovascular Disease	37,815 (18.54%)	37,815 (18.54%)	37,168 (18.23%)	187,132 (17.84%)	0.02	<.0001	0.01	0.0090
Renal Failure	65,691 (32.21%)	65,691 (32.21%)	64,045 (31.41%)	298,424 (28.45%)	0.08	<.0001	0.02	<.0001
COPD	76,450 (37.49%)	76,450 (37.49%)	76,115 (37.33%)	466,847 (44.50%)	-0.14	<.0001	0.00	0.2798
Pneumonia; pleural effusion/pneumothorax	102,634 (50.33%)	102,634 (50.33%)	104,244 (51.12%)	575,291 (54.84%)	-0.09	<.0001	-0.02	<.0001
Diabetes	98,668 (48.39%)	98,668 (48.39%)	97,158 (47.64%)	474,593 (45.24%)	0.06	<.0001	0.01	<.0001
Malnutrition	21,128 (10.36%)	21,128 (10.36%)	20,357 (9.98%)	105,149 (10.02%)	0.01	<.0001	0.01	0.0001
Dementia or other specified brain disorders	54,287 (26.62%)	54,287 (26.62%)	52,758 (25.87%)	285,166 (27.18%)	-0.01	<.0001	0.02	<.0001
Hemiplegia, paraplegia, paralysis, functional disability	17,390 (8.53%)	17,390 (8.53%)	17,069 (8.37%)	80,461 (7.67%)	0.03	<.0001	0.01	0.0716
Vascular disease and complications	67,995 (33.34%)	67,995 (33.34%)	67,888 (33.29%)	295,960 (28.21%)	0.11	<.0001	0.00	0.7247
Cancer	14,543 (7.13%)	14,543 (7.13%)	13,104 (6.43%)	63,063 (6.01%)	0.05	<.0001	0.03	<.0001
Trauma; other injuries	63,017 (30.90%)	63,017 (30.90%)	62,762 (30.78%)	314,786 (30.01%)	0.02	<.0001	0.00	0.3891
Major psychiatric disorders	23,815 (11.68%)	23,815 (11.68%)	22,039 (10.81%)	121,648 (11.60%)	0.00	0.2885	0.03	<.0001
Chronic Liver Disease	5,963 (2.92%)	5,963 (2.92%)	5,045 (2.47%)	21,178 (2.02%)	0.06	<.0001	0.03	<.0001
Severe hematological disorders	4,523 (2.22%)	4,523 (2.22%)	3,341 (1.64%)	18,814 (1.79%)	0.03	<.0001	0.04	<.0001

Variable	All Major Teaching Cases N=203,922	Matched Major Teaching Cases N=203,922	Matched Non-Teaching Controls N=203,922	All Non-Teaching Controls N=1,049,037	Std. Diff Before Match	P-value Before Match	Std. Diff After Match	P-value After Match
Iron deficiency or other/unspecified anemias and blood disease	116,714 (57.23%)	116,714 (57.23%)	117,655 (57.70%)	562,529 (53.62%)	0.07	<.0001	-0.01	0.0029
Depression	41,117 (20.16%)	41,117 (20.16%)	39,294 (19.27%)	210,185 (20.04%)	0.00	0.1897	0.02	<.0001
Parkinson's and Huntington's diseases	6,903 (3.39%)	6,903 (3.39%)	6,815 (3.34%)	36,755 (3.50%)	-0.01	0.0075	0.00	0.4499
Seizure disorders and convulsions	10,903 (5.35%)	10,903 (5.35%)	9,405 (4.61%)	48,552 (4.63%)	0.03	<.0001	0.03	<.0001
Fibrosis of lung or other chronic lung disorders	17,667 (8.66%)	17,667 (8.66%)	16,924 (8.30%)	103,140 (9.83%)	-0.04	<.0001	0.01	<.0001
Asthma	20,497 (10.05%)	20,497 (10.05%)	19,064 (9.35%)	91,258 (8.70%)	0.05	<.0001	0.02	<.0001
Predicted Risk								
30-Day Mortality Risk Quintile 1	41,851 (20.52%)	41,851 (20.52%)	41,851 (20.52%)	208,675 (19.89%)	0.02	<.0001	0.00	1.0000
30-Day Mortality Risk Quintile 2	39,207 (19.23%)	39,207 (19.23%)	39,207 (19.23%)	211,077 (20.12%)	-0.02	<.0001	0.00	1.0000
30-Day Mortality Risk Quintile 3	39,738 (19.49%)	39,738 (19.49%)	39,738 (19.49%)	211,207 (20.13%)	-0.02	<.0001	0.00	1.0000
30-Day Mortality Risk Quintile 4	40,547 (19.88%)	40,547 (19.88%)	40,547 (19.88%)	210,049 (20.02%)	0.00	0.1499	0.00	1.0000
30-Day Mortality Risk Quintile 5	42,579 (20.88%)	42,579 (20.88%)	42,579 (20.88%)	208,029 (19.83%)	0.03	<.0001	0.00	1.0000
Mean 30-day mortality risk quintile	3.0	3.0	3.0	3.0	0.01	<.0001	0.00	1.0000
Mean ICU risk quintile	3.1	3.1	3.1	3.0	0.06	<.0001	0.01	0.0079
Mean LOS risk quintile	3.1	3.1	3.0	3.0	0.05	<.0001	0.02	<.0001
Mean cost risk quintile	3.1	3.1	3.1	3.0	0.07	<.0001	0.02	<.0001
Risk score for 30-Day Mortality (mean)	12.1%	12.1%	12.0%	12.0%	0.01	0.0064	0.00	0.7169
Predicted ICU Utilization (mean)	51.0%	51.0%	51.0%	49.7%	0.08	<.0001	0.00	0.3615
Predicted LOS (mean)	4.6	4.6	4.6	4.5	0.03	<.0001	0.02	<.0001
Predicted Cost (mean)	14,632	14,632	14,575	14,316	0.08	<.0001	0.02	<.0001
Hospital Characteristics (Not Included in Matching Algorithm)								
Total Beds	554.4	554.4	225.6	227.7	1.11	<.0001	1.11	<.0001
Size Small (≤ 100 beds)	2,397 (1.18%)	2,397 (1.18%)	44,395 (21.77%)	275,521 (26.26%)	-0.78	<.0001	-0.64	<.0001
Size Medium (>100 to ≤ 250 beds)	27,616 (13.54%)	27,616 (13.54%)	88,284 (43.29%)	408,994 (38.99%)	-0.60	<.0001	-0.71	<.0001
Size Large (>250 beds)	173,909 (85.28%)	173,909 (85.28%)	71,243 (34.94%)	364,522 (34.75%)	1.20	<.0001	1.20	<.0001
COTH Member	140,312 (68.81%)	140,312 (68.81%)	--	--	--	--	--	--
RB Ratio (mean)	0.50	0.50	0.00	0.00	2.95	<.0001	2.95	<.0001
Very Major Teaching Hospital ($0.60 \leq RB$)	58,574 (28.72%)	58,574 (28.72%)	--	--	--	--	--	--
Major Teaching Hospital ($0.25 < RB < 0.60$)	145,348 (71.28%)	145,348 (71.28%)	--	--	--	--	--	--
Minor Teaching Hospital ($0.05 < RB \leq 0.25$)	--	--	--	--	--	--	--	--
Very Minor Teaching Hospital ($0.0 < RB \leq 0.05$)	--	--	40,919 (20.07%)	187,060 (17.83%)	--	--	--	--
Nonteaching Hospital ($RB = 0$)	--	--	163,003 (79.93%)	861,977 (82.17%)	--	--	--	--
NB Ratio (mean)	1.67	1.67	1.46	1.39	0.09	<.0001	0.07	<.0001
NB Ratio High ($1.0 \leq NB$)	174,602 (85.62%)	174,602 (85.62%)	145,219 (71.21%)	723,498 (68.97%)	0.41	<.0001	0.35	<.0001
NB Ratio Moderate ($0.5 \leq NB < 1.0$)	21,991 (10.78%)	21,991 (10.78%)	45,591 (22.36%)	248,106 (23.65%)	-0.35	<.0001	-0.31	<.0001
NB Ratio Low ($NB < 0.5$)	7,324 (3.59%)	7,324 (3.59%)	11,841 (5.81%)	71,676 (6.83%)	-0.15	<.0001	-0.10	<.0001
NB Ratio Missing	--	--	1,271 (0.62%)	5,757 (0.55%)	--	--	--	--
Nurse-Mix (mean)	0.94	0.94	0.90	0.88	0.49	<.0001	0.36	<.0001

Variable	All Major Teaching Cases N=203,922	Matched Major Teaching Cases N=203,922	Matched Non-Teaching Controls N=203,922	All Non-Teaching Controls N=1,049,037	Std. Diff Before Match	P-value Before Match	Std. Diff After Match	P-value After Match
Nurse-Mix High (90 < % RN)	173,000 (84.84%)	173,000 (84.84%)	127,837 (62.69%)	602,548 (57.44%)	0.63	<.0001	0.51	<.0001
Nurse-Mix Moderate (75 ≤ % RN ≤ 90)	24,385 (11.96%)	24,385 (11.96%)	56,314 (27.62%)	307,730 (29.33%)	-0.44	<.0001	-0.40	<.0001
Nurse-Mix Low (% RN < 75)	5,264 (2.58%)	5,264 (2.58%)	17,114 (8.39%)	127,525 (12.16%)	-0.37	<.0001	-0.23	<.0001
Nurse-Mix Missing	1,273 (0.62%)	1,273 (0.62%)	2,657 (1.30%)	11,234 (1.07%)	-0.05	<.0001	-0.07	<.0001
High Technology Hospital	119,499 (58.60%)	119,499 (58.60%)	40,683 (20.08%)	227,062 (21.76%)	0.81	<.0001	0.85	<.0001
Dual-Eligible	45,631 (22.38%)	45,631 (22.38%)	41,024 (20.12%)	212,933 (20.30%)	0.05	<.0001	0.06	<.0001

“--” indicates a blank cell.

Appendix Table 9a. Complete Matching Table for AMI The table below reports balance before and after matching between patients admitted to major teaching or non-teaching hospitals for AMI. All covariates met balance criteria.

Variable	All Major Teaching Cases N=43,990	Matched Major Teaching Cases N=43,990	Matched Non-Teaching Controls N=43,990	All Non-Teaching Controls N=237,122	Std. Diff Before Match	P-value Before Match	Std. Diff After Match	P-value After Match
Number of Hospitals	335	335	2,188	2,424				
Demographics								
Sex (% male)	22,785 (51.80%)	22,785 (51.80%)	22,785 (51.80%)	125,807 (53.06%)	-0.03	<.0001	0.00	1.0000
Age (mean)	78.5	78.5	78.6	78.1	0.04	<.0001	-0.02	0.0040
Age 65-69	8,141 (18.51%)	8,141 (18.51%)	7,930 (18.03%)	44,049 (18.58%)	0.00	0.7335	0.01	0.0669
Age 70-74	8,437 (19.18%)	8,437 (19.18%)	8,217 (18.68%)	47,308 (19.95%)	-0.02	0.0002	0.01	0.0595
Age 75-79	7,862 (17.87%)	7,862 (17.87%)	7,814 (17.76%)	44,559 (18.79%)	-0.02	<.0001	0.00	0.6788
Age 80-84	7,505 (17.06%)	7,505 (17.06%)	7,721 (17.55%)	41,888 (17.67%)	-0.02	0.0022	-0.01	0.0554
Age 85+	12,045 (27.38%)	12,045 (27.38%)	12,308 (27.98%)	59,318 (25.02%)	0.05	<.0001	-0.01	0.0484
Year (mean)	2013.1	2013.1	2013.1	2013.1	-0.00	0.3755	-0.00	0.8608
Year 2012	10,169 (23.12%)	10,169 (23.12%)	9,889 (22.48%)	54,566 (23.01%)	0.00	0.6306	0.02	0.0250
Year 2013	18,271 (41.53%)	18,271 (41.53%)	18,750 (42.62%)	98,180 (41.40%)	0.00	0.6130	-0.02	0.0011
Year 2014	15,550 (35.35%)	15,550 (35.35%)	15,351 (34.90%)	84,376 (35.58%)	0.00	0.3482	0.01	0.1620
Race- non-Hispanic White	32,466 (73.80%)	32,466 (73.80%)	33,385 (75.89%)	205,326 (86.59%)	-0.33	<.0001	-0.05	<.0001
Race- Black	7,021 (15.96%)	7,021 (15.96%)	6,387 (14.52%)	13,928 (5.87%)	0.33	<.0001	0.05	<.0001
Race- Hispanic	2,713 (6.17%)	2,713 (6.17%)	2,272 (5.16%)	10,870 (4.58%)	0.07	<.0001	0.04	<.0001
Race- Other	1,790 (4.07%)	1,790 (4.07%)	1,946 (4.42%)	6,998 (2.95%)	0.06	<.0001	-0.02	0.0095
Emergent type admission	39,298 (89.33%)	39,298 (89.33%)	39,021 (88.70%)	167,439 (70.61%)	0.48	<.0001	0.02	0.0029
Treatment at another hospital's ED	121 (0.28%)	121 (0.28%)	130 (0.30%)	722 (0.30%)	-0.01	0.3188	0.00	0.6132
Prior care at SNF	114 (0.26%)	114 (0.26%)	150 (0.34%)	585 (0.25%)	0.00	0.6389	-0.02	0.0308
Prior care at ASC	53 (0.12%)	53 (0.12%)	58 (0.13%)	4,167 (1.76%)	-0.17	<.0001	0.00	0.7042
Prior intermediate care facility visit	84 (0.19%)	84 (0.19%)	80 (0.18%)	4,351 (1.83%)	-0.16	<.0001	0.00	0.8147
Prior dialysis visit	233 (0.53%)	233 (0.53%)	218 (0.50%)	1,694 (0.71%)	-0.02	<.0001	0.00	0.5087
Region Northeast	20,665 (46.98%)	20,665 (46.98%)	20,490 (46.58%)	48,276 (20.36%)	0.59	<.0001	0.01	0.2397
Region Midwest	13,691 (31.12%)	13,691 (31.12%)	13,312 (30.26%)	55,740 (23.51%)	0.17	<.0001	0.02	0.0057
Region Pacific	2,476 (5.63%)	2,476 (5.63%)	2,970 (6.75%)	27,103 (11.43%)	-0.21	<.0001	-0.04	<.0001
Region South	6,262 (14.24%)	6,262 (14.24%)	6,331 (14.39%)	92,028 (38.81%)	-0.58	<.0001	0.00	0.5127
Region Rockies	896 (2.04%)	896 (2.04%)	887 (2.02%)	13,975 (5.89%)	-0.20	<.0001	0.00	0.8482
Admission Conditions								
STEMI Type 1	3,557 (8.09%)	3,557 (8.09%)	3,557 (8.09%)	18,771 (7.92%)	0.01	0.2265	0.00	1.0000
STEMI Type 2	5,576 (12.68%)	5,576 (12.68%)	5,576 (12.68%)	28,931 (12.20%)	0.01	0.0055	0.00	1.0000
NSTEMI or unspecified MI	34,857 (79.24%)	34,857 (79.24%)	34,857 (79.24%)	189,420 (79.88%)	-0.02	0.0021	0.00	1.0000
Comorbidities								
History of PTCA	3,600 (8.18%)	3,600 (8.18%)	3,903 (8.87%)	18,318 (7.73%)	0.02	0.0011	-0.03	0.0003
History of CABG	3,435 (7.81%)	3,435 (7.81%)	3,863 (8.78%)	19,176 (8.09%)	-0.01	0.0493	-0.04	<.0001
Heart Failure	10,617 (24.14%)	10,617 (24.14%)	10,492 (23.85%)	53,887 (22.73%)	0.03	<.0001	0.01	0.3276
Myocardial Infarction	4,961 (11.28%)	4,961 (11.28%)	4,832 (10.98%)	34,786 (14.67%)	-0.10	<.0001	0.01	0.1700

Variable	All Major Teaching Cases N=43,990	Matched Major Teaching Cases N=43,990	Matched Non-Teaching Controls N=43,990	All Non-Teaching Controls N=237,122	Std. Diff Before Match	P-value Before Match	Std. Diff After Match	P-value After Match
Unstable Angina	6,037 (13.72%)	6,037 (13.72%)	5,848 (13.29%)	32,387 (13.66%)	0.00	0.7168	0.01	0.0637
Cardio-respiratory Failure or Shock	3,075 (6.99%)	3,075 (6.99%)	2,856 (6.49%)	18,545 (7.82%)	-0.03	<.0001	0.02	0.0034
Valvular Heart Disease	13,884 (31.56%)	13,884 (31.56%)	14,277 (32.46%)	76,142 (32.11%)	-0.01	0.0236	-0.02	0.0046
Hypertension	39,519 (89.84%)	39,519 (89.84%)	39,149 (89.00%)	211,732 (89.29%)	0.02	0.0006	0.03	0.0001
Stroke	3,030 (6.89%)	3,030 (6.89%)	2,854 (6.49%)	13,362 (5.64%)	0.05	<.0001	0.02	0.0182
Cerebrovascular Disease	7,298 (16.59%)	7,298 (16.59%)	6,911 (15.71%)	36,052 (15.20%)	0.04	<.0001	0.02	0.0004
Renal Failure	9,980 (22.69%)	9,980 (22.69%)	9,462 (21.51%)	48,139 (20.30%)	0.06	<.0001	0.03	<.0001
COPD	10,546 (23.97%)	10,546 (23.97%)	10,232 (23.26%)	68,310 (28.81%)	-0.11	<.0001	0.02	0.0130
Pneumonia; pleural effusion/pneumothorax	9,137 (20.77%)	9,137 (20.77%)	9,089 (20.66%)	48,527 (20.46%)	0.01	0.1463	0.00	0.6958
Diabetes	21,150 (48.08%)	21,150 (48.08%)	20,916 (47.55%)	105,927 (44.67%)	0.07	<.0001	0.01	0.1158
Malnutrition	2,551 (5.80%)	2,551 (5.80%)	2,304 (5.24%)	11,864 (5.00%)	0.04	<.0001	0.02	0.0003
Dementia or other specified brain disorders	8,471 (19.26%)	8,471 (19.26%)	8,200 (18.64%)	42,960 (18.12%)	0.03	<.0001	0.02	0.0202
Hemiplegia, paraplegia, paralysis, functional disability	2,573 (5.85%)	2,573 (5.85%)	2,346 (5.33%)	11,581 (4.88%)	0.04	<.0001	0.02	0.0009
Vascular disease and complications	11,585 (26.34%)	11,585 (26.34%)	11,682 (26.56%)	51,162 (21.58%)	0.11	<.0001	-0.01	0.4631
Cancer	1,832 (4.16%)	1,832 (4.16%)	1,459 (3.32%)	7,970 (3.36%)	0.04	<.0001	0.04	<.0001
Trauma; other injuries	11,324 (25.74%)	11,324 (25.74%)	11,041 (25.10%)	55,953 (23.60%)	0.05	<.0001	0.01	0.0290
Major psychiatric disorders	3,474 (7.90%)	3,474 (7.90%)	3,610 (8.21%)	17,269 (7.28%)	0.02	<.0001	-0.01	0.0944
Chronic Liver Disease	828 (1.88%)	828 (1.88%)	865 (1.97%)	2,970 (1.25%)	0.05	<.0001	-0.01	0.3770
Severe hematological disorders	555 (1.26%)	555 (1.26%)	477 (1.08%)	2,422 (1.02%)	0.02	<.0001	0.02	0.0159
Iron deficiency or other/unspecified anemias and blood disease	20,822 (47.33%)	20,822 (47.33%)	20,645 (46.93%)	100,623 (42.44%)	0.10	<.0001	0.01	0.2346
Depression	6,288 (14.29%)	6,288 (14.29%)	6,547 (14.88%)	33,510 (14.13%)	0.00	0.3716	-0.02	0.0137
Parkinson's and Huntington's diseases	955 (2.17%)	955 (2.17%)	1,096 (2.49%)	4,976 (2.10%)	0.01	0.3294	-0.02	0.0018
Seizure disorders and convulsions	1,785 (4.06%)	1,785 (4.06%)	1,785 (4.06%)	7,902 (3.33%)	0.04	<.0001	0.00	1.0000
Fibrosis of lung or other chronic lung disorders	1,872 (4.26%)	1,872 (4.26%)	1,710 (3.89%)	11,640 (4.91%)	-0.03	<.0001	0.02	0.0060
Asthma	3,193 (7.26%)	3,193 (7.26%)	2,905 (6.60%)	13,848 (5.84%)	0.06	<.0001	0.03	0.0001
Predicted Risk								
30-Day Mortality Risk Quintile 1	7,908 (17.98%)	7,908 (17.98%)	7,908 (17.98%)	48,257 (20.35%)	-0.06	<.0001	0.00	1.0000
30-Day Mortality Risk Quintile 2	8,516 (19.36%)	8,516 (19.36%)	8,516 (19.36%)	47,762 (20.14%)	-0.02	0.0002	0.00	1.0000
30-Day Mortality Risk Quintile 3	8,650 (19.66%)	8,650 (19.66%)	8,650 (19.66%)	47,574 (20.06%)	-0.01	0.0548	0.00	1.0000
30-Day Mortality Risk Quintile 4	9,273 (21.08%)	9,273 (21.08%)	9,273 (21.08%)	46,944 (19.80%)	0.03	<.0001	0.00	1.0000
30-Day Mortality Risk Quintile 5	9,643 (21.92%)	9,643 (21.92%)	9,643 (21.92%)	46,585 (19.65%)	0.06	<.0001	0.00	1.0000
Mean 30-day mortality risk quintile	3.1	3.1	3.1	3.0	0.08	<.0001	0.00	1.0000
Mean ICU risk quintile	3.0	3.0	3.0	3.0	-0.01	0.0090	0.00	0.7799
Mean LOS risk quintile	3.1	3.1	3.0	3.0	0.06	<.0001	0.02	0.0107
Mean cost risk quintile	3.1	3.1	3.0	3.0	0.05	<.0001	0.01	0.0465
Risk score for 30-Day Mortality (mean)	12.8%	12.8%	12.7%	12.0%	0.07	<.0001	0.00	0.8320
Predicted ICU Utilization (mean)	75.1%	75.1%	75.1%	75.3%	-0.01	0.0015	0.00	0.6454
Predicted LOS (mean)	4.1	4.1	4.1	4.1	0.06	<.0001	0.02	0.0069

Variable	All Major Teaching Cases N=43,990	Matched Major Teaching Cases N=43,990	Matched Non-Teaching Controls N=43,990	All Non-Teaching Controls N=237,122	Std. Diff Before Match	P-value Before Match	Std. Diff After Match	P-value After Match	
Predicted Cost (mean)	\$17,817	\$17,817	\$17,750	\$17,590	0.05	<.0001	0.02	0.0360	
Hospital Characteristics (Not Included in Matching Algorithm)									
Total Beds	538.1	538.1	228.4	219.5	1.11	<.0001	1.08	<.0001	
Size Small (≤ 100 beds)	529 (1.20%)	529 (1.20%)	9,588 (21.80%)	70,036 (29.54%)	-0.85	<.0001	-0.62	<.0001	
Size Medium (>100 to ≤ 250 beds)	6,082 (13.83%)	6,082 (13.83%)	18,544 (42.16%)	87,919 (37.08%)	-0.55	<.0001	-0.67	<.0001	
Size Large (>250 beds)	37,379 (84.97%)	37,379 (84.97%)	15,858 (36.05%)	79,167 (33.39%)	1.23	<.0001	1.17	<.0001	
COTH Member	29,685 (67.48%)	29,685 (67.48%)	--	--	--	--	--	--	
RB Ratio (mean)	0.50	0.50	0.00	0.00	2.97	<.0001	2.96	<.0001	
Very Major Teaching Hospital ($0.60 \leq RB$)	12,534 (28.49%)	12,534 (28.49%)	--	--	--	--	--	--	
Major Teaching Hospital ($0.25 < RB < 0.60$)	31,456 (71.51%)	31,456 (71.51%)	--	--	--	--	--	--	
Minor Teaching Hospital ($0.05 < RB \leq 0.25$)	--	--	--	--	--	--	--	--	
Very Minor Teaching Hospital ($0.0 < RB \leq 0.05$)	--	--	8,805 (20.02%)	40,400 (17.04%)	--	--	--	--	
Nonteaching Hospital ($RB = 0$)	--	--	35,185 (79.98%)	196,722 (82.96%)	--	--	--	--	
NB Ratio (mean)	1.67	1.67	1.51	1.44	0.07	<.0001	0.05	<.0001	
NB Ratio High ($1.0 \leq NB$)	37,535 (85.33%)	37,535 (85.33%)	31,579 (71.79%)	164,813 (69.51%)	0.39	<.0001	0.33	<.0001	
NB Ratio Moderate ($0.5 \leq NB < 1.0$)	4,746 (10.79%)	4,746 (10.79%)	9,748 (22.16%)	55,159 (23.26%)	-0.34	<.0001	-0.31	<.0001	
NB Ratio Low ($NB < 0.5$)	1,709 (3.88%)	1,709 (3.88%)	2,499 (5.68%)	16,339 (6.89%)	-0.13	<.0001	-0.08	<.0001	
NB Ratio Missing	--	--	164 (0.37%)	811 (0.34%)	--	--	--	--	
Nurse-Mix (mean)	0.94	0.94	0.90	0.88	0.50	<.0001	0.37	<.0001	
Nurse-Mix High ($90 < \% RN$)	36,649 (83.31%)	36,649 (83.31%)	27,198 (61.83%)	134,712 (56.81%)	0.60	<.0001	0.49	<.0001	
Nurse-Mix Moderate ($75 \leq \% RN \leq 90$)	5,883 (13.37%)	5,883 (13.37%)	12,482 (28.37%)	70,391 (29.69%)	-0.40	<.0001	-0.37	<.0001	
Nurse-Mix Low ($\% RN < 75$)	1,091 (2.48%)	1,091 (2.48%)	3,869 (8.80%)	30,022 (12.66%)	-0.39	<.0001	-0.24	<.0001	
Nurse-Mix Missing	367 (0.83%)	367 (0.83%)	441 (1.00%)	1,997 (0.84%)	0.00	0.8870	-0.02	0.0098	
High Technology Hospital	25,820 (58.70%)	25,820 (58.70%)	9,131 (20.83%)	49,883 (21.11%)	0.83	<.0001	0.84	<.0001	
Dual-Eligible	9,018 (20.50%)	9,018 (20.50%)	7,537 (17.13%)	39,345 (16.59%)	0.10	<.0001	0.09	<.0001	
Patient received PCI	16,888 (38.39%)	16,888 (38.39%)	14,646 (33.29%)	88,204 (37.20%)	0.02	<.0001	0.11	<.0001	
Patient received CABG	2,860 (6.50%)	2,860 (6.50%)	2,137 (4.86%)	14,869 (6.27%)	0.01	0.0679	0.07	<.0001	

"--" indicates a blank cell.

Appendix Table 9b. Complete Matching Table for HF The table below reports balance before and after matching between patients admitted to major teaching or non-teaching hospitals for congestive heart failure. All covariates met balance criteria.

Variable	All Major Teaching Cases N=84,985	Matched Major Teaching Cases N=84,985	Matched Non-Teaching Controls N=84,985	All Non-Teaching Controls N=358,729	Std. Diff Before Match	P-value Before Match	Std. Diff After Match	P-value After Match
Number of Hospitals	338	338	2,346	2,466				
Demographics								
Sex (% male)	39,399 (46.36%)	39,399 (46.36%)	39,850 (46.89%)	162,005 (45.16%)	0.02	<.0001	-0.01	0.0287
Age (mean)	80.4	80.4	80.5	81.0	-0.07	<.0001	-0.01	0.0215
Age 65-69	11,598 (13.65%)	11,598 (13.65%)	11,466 (13.49%)	40,040 (11.16%)	0.08	<.0001	0.00	0.3535
Age 70-74	12,952 (15.24%)	12,952 (15.24%)	12,903 (15.18%)	51,351 (14.31%)	0.03	<.0001	0.00	0.7458
Age 75-79	14,096 (16.59%)	14,096 (16.59%)	13,893 (16.35%)	60,490 (16.86%)	-0.01	0.0532	0.01	0.1865
Age 80-84	16,032 (18.86%)	16,032 (18.86%)	15,891 (18.70%)	72,618 (20.24%)	-0.03	<.0001	0.00	0.3846
Age 85+	30,307 (35.66%)	30,307 (35.66%)	30,832 (36.28%)	134,230 (37.42%)	-0.04	<.0001	-0.01	0.0081
Year (mean)	2013.1	2013.1	2013.1	2013.1	-0.01	0.0002	0.00	0.6629
Year 2012	22,468 (26.44%)	22,468 (26.44%)	22,264 (26.20%)	92,450 (25.77%)	0.02	0.0001	0.01	0.2635
Year 2013	34,875 (41.04%)	34,875 (41.04%)	35,134 (41.34%)	148,106 (41.29%)	-0.01	0.1838	-0.01	0.2036
Year 2014	27,642 (32.53%)	27,642 (32.53%)	27,587 (32.46%)	118,173 (32.94%)	-0.01	0.0202	0.00	0.7797
Race- non-Hispanic White	59,811 (70.38%)	59,811 (70.38%)	62,896 (74.01%)	299,484 (83.48%)	-0.31	<.0001	-0.09	<.0001
Race- Black	17,733 (20.87%)	17,733 (20.87%)	15,416 (18.14%)	32,407 (9.03%)	0.34	<.0001	0.08	<.0001
Race- Hispanic	4,642 (5.46%)	4,642 (5.46%)	3,884 (4.57%)	17,495 (4.88%)	0.03	<.0001	0.04	<.0001
Race- Other	2,799 (3.29%)	2,799 (3.29%)	2,789 (3.28%)	9,343 (2.60%)	0.04	<.0001	0.00	0.9026
Emergent type admission	71,794 (84.48%)	71,794 (84.48%)	71,078 (83.64%)	271,355 (75.64%)	0.22	<.0001	0.02	<.0001
Treatment at another hospital's ED	16 (0.02%)	16 (0.02%)	--	66 (0.02%)	0.00	0.8889	--	--
Prior care at SNF	282 (0.33%)	282 (0.33%)	309 (0.36%)	1,632 (0.45%)	-0.02	<.0001	-0.01	0.2840
Prior care at ASC	98 (0.12%)	98 (0.12%)	93 (0.11%)	2,460 (0.69%)	-0.09	<.0001	0.00	0.7722
Prior intermediate care facility visit	175 (0.21%)	175 (0.21%)	144 (0.17%)	2,804 (0.78%)	-0.08	<.0001	0.01	0.0926
Prior dialysis visit	470 (0.55%)	470 (0.55%)	438 (0.52%)	2,558 (0.71%)	-0.02	<.0001	0.00	0.3023
Region Northeast	41,855 (49.25%)	41,855 (49.25%)	41,592 (48.94%)	76,664 (21.37%)	0.61	<.0001	0.01	0.2037
Region Midwest	26,408 (31.07%)	26,408 (31.07%)	25,621 (30.15%)	79,997 (22.30%)	0.20	<.0001	0.02	<.0001
Region Pacific	4,379 (5.15%)	4,379 (5.15%)	4,628 (5.45%)	39,859 (11.11%)	-0.22	<.0001	-0.01	0.0072
Region South	10,985 (12.93%)	10,985 (12.93%)	11,782 (13.86%)	146,480 (40.83%)	-0.66	<.0001	-0.02	<.0001
Region Rockies	1,358 (1.60%)	1,358 (1.60%)	1,362 (1.60%)	15,729 (4.38%)	-0.16	<.0001	0.00	0.9538
Admission Conditions								
HF with Chronic Kidney Disease	5,773 (6.79%)	5,773 (6.79%)	5,773 (6.79%)	17,169 (4.79%)	0.09	<.0001	0.00	1.0000
HF with Hypertension	2,270 (2.67%)	2,270 (2.67%)	2,270 (2.67%)	9,111 (2.54%)	0.01	0.0299	0.00	1.0000
HF, Other	76,942 (90.54%)	76,942 (90.54%)	76,942 (90.54%)	332,449 (92.67%)	-0.08	<.0001	0.00	1.0000
Comorbidities								
History of PTCA	7,616 (8.96%)	7,616 (8.96%)	7,815 (9.20%)	30,206 (8.42%)	0.02	<.0001	-0.01	0.0946
History of CABG	10,510 (12.37%)	10,510 (12.37%)	10,914 (12.84%)	45,381 (12.65%)	-0.01	0.0250	-0.01	0.0032
Heart Failure	56,423 (66.39%)	56,423 (66.39%)	56,157 (66.08%)	224,521 (62.59%)	0.08	<.0001	0.01	0.1741
Myocardial Infarction	2,852 (3.36%)	2,852 (3.36%)	2,670 (3.14%)	10,614 (2.96%)	0.02	<.0001	0.01	0.0133
Unstable Angina	7,075 (8.32%)	7,075 (8.32%)	6,658 (7.83%)	22,432 (6.25%)	0.08	<.0001	0.02	0.0002

Variable	All Major Teaching Cases N=84,985	Matched Major Teaching Cases N=84,985	Matched Non-Teaching Controls N=84,985	All Non-Teaching Controls N=358,729	Std. Diff Before Match	P-value Before Match	Std. Diff After Match	P-value After Match
Cardio-respiratory Failure or Shock	15,141 (17.82%)	15,141 (17.82%)	15,447 (18.18%)	67,965 (18.95%)	-0.03	<.0001	-0.01	0.0541
Valvular Heart Disease	42,738 (50.29%)	42,738 (50.29%)	43,251 (50.89%)	180,048 (50.19%)	0.00	0.6065	-0.01	0.0130
Hypertension	78,570 (92.45%)	78,570 (92.45%)	77,942 (91.71%)	331,282 (92.35%)	0.00	0.3145	0.03	<.0001
Stroke	7,267 (8.55%)	7,267 (8.55%)	5,803 (6.83%)	26,450 (7.37%)	0.04	<.0001	0.06	<.0001
Cerebrovascular Disease	15,083 (17.75%)	15,083 (17.75%)	13,755 (16.19%)	63,597 (17.73%)	0.00	0.8927	0.04	<.0001
Renal Failure	34,816 (40.97%)	34,816 (40.97%)	34,454 (40.54%)	137,651 (38.37%)	0.05	<.0001	0.01	0.0747
COPD	33,042 (38.88%)	33,042 (38.88%)	32,890 (38.70%)	162,744 (45.37%)	-0.13	<.0001	0.00	0.4523
Pneumonia; pleural effusion/pneumothorax	33,777 (39.74%)	33,777 (39.74%)	33,808 (39.78%)	152,116 (42.40%)	-0.05	<.0001	0.00	0.8818
Diabetes	45,696 (53.77%)	45,696 (53.77%)	45,337 (53.35%)	184,895 (51.54%)	0.04	<.0001	0.01	0.0817
Malnutrition	6,912 (8.13%)	6,912 (8.13%)	6,682 (7.86%)	28,983 (8.08%)	0.00	0.6047	0.01	0.0406
Dementia or other specified brain disorders	18,110 (21.31%)	18,110 (21.31%)	16,958 (19.95%)	82,197 (22.91%)	-0.04	<.0001	0.03	<.0001
Hemiplegia, paraplegia, paralysis, functional disability	6,086 (7.16%)	6,086 (7.16%)	4,731 (5.57%)	24,384 (6.80%)	0.01	0.0002	0.06	<.0001
Vascular disease and complications	30,300 (35.65%)	30,300 (35.65%)	30,011 (35.31%)	112,228 (31.28%)	0.09	<.0001	0.01	0.1443
Cancer	4,000 (4.71%)	4,000 (4.71%)	3,348 (3.94%)	14,251 (3.97%)	0.04	<.0001	0.04	<.0001
Trauma; other injuries	25,226 (29.68%)	25,226 (29.68%)	24,977 (29.39%)	106,285 (29.63%)	0.00	0.7541	0.01	0.1873
Major psychiatric disorders	7,913 (9.31%)	7,913 (9.31%)	6,782 (7.98%)	33,700 (9.39%)	0.00	0.4597	0.05	<.0001
Chronic Liver Disease	3,088 (3.63%)	3,088 (3.63%)	2,473 (2.91%)	9,343 (2.60%)	0.06	<.0001	0.04	<.0001
Severe hematological disorders	2,017 (2.37%)	2,017 (2.37%)	1,519 (1.79%)	7,411 (2.07%)	0.02	<.0001	0.04	<.0001
Iron deficiency or other/unspecified anemias and blood disease	50,705 (59.66%)	50,705 (59.66%)	50,984 (59.99%)	205,039 (57.16%)	0.05	<.0001	-0.01	0.1690
Depression	15,821 (18.62%)	15,821 (18.62%)	14,806 (17.42%)	67,037 (18.69%)	0.00	0.6349	0.03	<.0001
Parkinson's and Huntington's diseases	1,860 (2.19%)	1,860 (2.19%)	1,464 (1.72%)	8,609 (2.40%)	-0.01	0.0002	0.03	<.0001
Seizure disorders and convulsions	3,272 (3.85%)	3,272 (3.85%)	2,554 (3.01%)	12,213 (3.40%)	0.02	<.0001	0.05	<.0001
Fibrosis of lung or other chronic lung disorders	6,303 (7.42%)	6,303 (7.42%)	5,140 (6.05%)	30,446 (8.49%)	-0.04	<.0001	0.05	<.0001
Asthma	8,364 (9.84%)	8,364 (9.84%)	7,054 (8.30%)	29,639 (8.26%)	0.06	<.0001	0.05	<.0001
Predicted Risk								
30-Day Mortality Risk Quintile 1	19,968 (23.50%)	19,968 (23.50%)	19,968 (23.50%)	68,769 (19.17%)	0.11	<.0001	0.00	1.0000
30-Day Mortality Risk Quintile 2	16,803 (19.77%)	16,803 (19.77%)	16,803 (19.77%)	71,944 (20.06%)	-0.01	0.0636	0.00	1.0000
30-Day Mortality Risk Quintile 3	16,184 (19.04%)	16,184 (19.04%)	16,184 (19.04%)	72,542 (20.22%)	-0.03	<.0001	0.00	1.0000
30-Day Mortality Risk Quintile 4	15,995 (18.82%)	15,995 (18.82%)	15,995 (18.82%)	72,763 (20.28%)	-0.04	<.0001	0.00	1.0000
30-Day Mortality Risk Quintile 5	16,035 (18.87%)	16,035 (18.87%)	16,035 (18.87%)	72,711 (20.27%)	-0.04	<.0001	0.00	1.0000
Mean 30-day mortality risk quintile	2.9	2.9	2.9	3.0	-0.09	<.0001	0.00	1.0000
Mean ICU risk quintile	3.1	3.1	3.1	3.0	0.06	<.0001	0.01	0.2548
Mean LOS risk quintile	3.0	3.0	3.0	3.0	-0.01	0.1455	0.03	<.0001
Mean cost risk quintile	3.0	3.0	3.0	3.0	0.02	<.0001	0.03	<.0001
Risk score for 30-Day Mortality (mean)	9.7%	9.7%	9.6%	10.1%	-0.06	<.0001	0.01	0.9121
Predicted ICU Utilization (mean)	51.9%	51.9%	51.8%	51.5%	0.06	<.0001	0.01	0.2172
Predicted LOS (mean)	4.4	4.4	4.4	4.4	0.00	0.1236	0.02	<.0001
Predicted Cost (mean)	14,437	14,437	14,380	14,355	0.03	<.0001	0.02	<.0001

Variable	All Major Teaching Cases N=84,985	Matched Major Teaching Cases N=84,985	Matched Non-Teaching Controls N=84,985	All Non-Teaching Controls N=358,729	Std. Diff Before Match	P-value Before Match	Std. Diff After Match	P-value After Match	
Hospital Characteristics (Not Included in Matching Algorithm)									
Total Beds	559.7	559.7	227.6	237.5	1.07	<.0001	1.10	<.0001	
Size Small (≤ 100 beds)	921 (1.08%)	921 (1.08%)	18,045 (21.23%)	84,711 (23.61%)	-0.73	<.0001	-0.65	<.0001	
Size Medium (>100 to ≤ 250 beds)	11,106 (13.07%)	11,106 (13.07%)	36,879 (43.39%)	142,231 (39.65%)	-0.63	<.0001	-0.72	<.0001	
Size Large (>250 beds)	72,958 (85.85%)	72,958 (85.85%)	30,061 (35.37%)	131,787 (36.74%)	1.17	<.0001	1.20	<.0001	
COTH Member	59,135 (69.58%)	59,135 (69.58%)	--	--	--	--	--	--	
RB Ratio (mean)	0.50	0.50	0.00	0.00	2.97	<.0001	2.96	<.0001	
Very Major Teaching Hospital ($0.60 \leq RB$)	24,499 (28.83%)	24,499 (28.83%)	--	--	--	--	--	--	
Major Teaching Hospital ($0.25 < RB < 0.60$)	60,486 (71.17%)	60,486 (71.17%)	--	--	--	--	--	--	
Minor Teaching Hospital ($0.05 < RB \leq 0.25$)	--	--	--	--	--	--	--	--	
Very Minor Teaching Hospital ($0.0 < RB \leq 0.05$)	--	--	17,841 (20.99%)	68,597 (19.12%)	0.00	<.0001	0.00	<.0001	
Nonteaching Hospital ($RB = 0$)	--	--	67,144 (79.01%)	290,132 (80.88%)	0.00	<.0001	0.00	<.0001	
NB Ratio (mean)	1.68	1.68	1.45	1.39	0.09	<.0001	0.07	<.0001	
NB Ratio High ($1.0 \leq NB$)	73,112 (86.03%)	73,112 (86.03%)	60,373 (71.04%)	247,761 (69.07%)	0.42	<.0001	0.37	<.0001	
NB Ratio Moderate ($0.5 \leq NB < 1.0$)	8,902 (10.47%)	8,902 (10.47%)	18,998 (22.35%)	84,261 (23.49%)	-0.35	<.0001	-0.32	<.0001	
NB Ratio Low ($NB < 0.5$)	2,969 (3.49%)	2,969 (3.49%)	5,169 (6.08%)	24,780 (6.91%)	-0.15	<.0001	-0.12	<.0001	
NB Ratio Missing	--	--	445 (0.52%)	1,927 (0.54%)	--	--	--	--	
Nurse-Mix (mean)	0.94	0.94	0.90	0.88	0.48	<.0001	0.37	<.0001	
Nurse-Mix High ($90 < \% RN$)	72,120 (84.86%)	72,120 (84.86%)	53,560 (63.02%)	209,278 (58.34%)	0.62	<.0001	0.51	<.0001	
Nurse-Mix Moderate ($75 \leq \% RN \leq 90$)	10,249 (12.06%)	10,249 (12.06%)	23,229 (27.33%)	104,180 (29.04%)	-0.43	<.0001	-0.39	<.0001	
Nurse-Mix Low ($\% RN < 75$)	2,076 (2.44%)	2,076 (2.44%)	7,171 (8.44%)	41,435 (11.55%)	-0.36	<.0001	-0.24	<.0001	
Nurse-Mix Missing	540 (0.64%)	540 (0.64%)	1,025 (1.21%)	3,836 (1.07%)	-0.05	<.0001	-0.06	<.0001	
High Technology Hospital	19,003 (22.36%)	19,003 (22.36%)	16,970 (19.97%)	72,632 (20.25%)	0.05	<.0001	0.06	<.0001	
Dual-Eligible	78,096 (91.89%)	78,096 (91.89%)	53,305 (62.72%)	229,650 (64.02%)	0.71	<.0001	0.75	<.0001	

“--” indicates a blank cell.

Appendix Table 9c. Complete Matching Table for PNA The table below reports balance before and after matching between patients admitted to major teaching or non-teaching hospitals for pneumonia. All covariates met balance criteria.

Variable	All Major Teaching Cases N=74,947	Matched Major Teaching Cases N=74,947	Matched Non-Teaching Controls N=74,947	All Non-Teaching Controls N=453,186	Std. Diff Before Match	P-value Before Match	Std. Diff After Match	P-value After Match	
Number of Hospitals	337	337	2,351	2,501					
Demographics									
Sex (% male)	35,176 (46.93%)	35,176 (46.93%)	35,404 (47.24%)	210,190 (46.38%)	0.01	0.0049	-0.01	0.2401	
Age (mean)	80.7	80.7	80.7	80.5	0.02	<.0001	0.01	0.3013	
Age 65-69	9,744 (13.00%)	9,744 (13.00%)	9,441 (12.60%)	55,490 (12.24%)	0.02	<.0001	0.01	0.0195	
Age 70-74	11,314 (15.10%)	11,314 (15.10%)	11,294 (15.07%)	70,477 (15.55%)	-0.01	0.0014	0.00	0.8909	
Age 75-79	12,060 (16.09%)	12,060 (16.09%)	12,407 (16.55%)	78,725 (17.37%)	-0.03	<.0001	-0.01	0.0156	
Age 80-84	13,929 (18.59%)	13,929 (18.59%)	14,677 (19.58%)	88,530 (19.54%)	-0.02	<.0001	-0.03	<.0001	
Age 85+	27,900 (37.23%)	27,900 (37.23%)	27,128 (36.20%)	159,964 (35.30%)	0.04	<.0001	0.02	<.0001	
Year (mean)	2013.1	2013.1	2013.1	2013.1	-0.01	0.0762	0.00	0.7303	
Year 2012	17,864 (23.84%)	17,864 (23.84%)	17,755 (23.69%)	106,766 (23.56%)	0.01	0.0993	0.00	0.5122	
Year 2013	32,798 (43.76%)	32,798 (43.76%)	33,098 (44.16%)	198,449 (43.79%)	0.00	0.8862	-0.01	0.1197	
Year 2014	24,285 (32.40%)	24,285 (32.40%)	24,094 (32.15%)	147,971 (32.65%)	-0.01	0.1797	0.01	0.2939	
Race- non-Hispanic White	55,858 (74.53%)	55,858 (74.53%)	56,672 (75.62%)	388,780 (85.79%)	-0.29	<.0001	-0.03	<.0001	
Race- Black	11,153 (14.88%)	11,153 (14.88%)	10,869 (14.50%)	28,556 (6.30%)	0.28	<.0001	0.01	0.0389	
Race- Hispanic	4,771 (6.37%)	4,771 (6.37%)	4,164 (5.56%)	21,539 (4.75%)	0.07	<.0001	0.04	<.0001	
Race- Other	3,165 (4.22%)	3,165 (4.22%)	3,242 (4.33%)	14,311 (3.16%)	0.06	<.0001	-0.01	0.3318	
Emergent type admission	67,711 (90.35%)	67,711 (90.35%)	67,382 (89.91%)	353,418 (77.99%)	0.34	<.0001	0.01	0.0045	
Treatment at another hospital's ED	13 (0.02%)	13 (0.02%)	--	84 (0.02%)	0.00	1.0000	--	--	
Prior care at SNF	663 (0.88%)	663 (0.88%)	793 (1.06%)	3,924 (0.87%)	0.00	0.6101	-0.02	0.0007	
Prior care at ASC	38 (0.05%)	38 (0.05%)	36 (0.05%)	2,042 (0.45%)	-0.08	<.0001	0.00	0.9075	
Prior intermediate care facility visit	93 (0.12%)	93 (0.12%)	68 (0.09%)	2,506 (0.55%)	-0.07	<.0001	0.01	0.0581	
Prior dialysis visit	451 (0.60%)	451 (0.60%)	402 (0.54%)	3,520 (0.78%)	-0.02	<.0001	0.01	0.0993	
Region Northeast	37,452 (49.97%)	37,452 (49.97%)	37,516 (50.06%)	90,006 (19.86%)	0.67	<.0001	0.00	0.7448	
Region Midwest	21,930 (29.26%)	21,930 (29.26%)	21,627 (28.86%)	98,939 (21.83%)	0.17	<.0001	0.01	0.0858	
Region Pacific	4,463 (5.95%)	4,463 (5.95%)	4,712 (6.29%)	50,731 (11.19%)	-0.19	<.0001	-0.01	0.0075	
Region South	9,926 (13.24%)	9,926 (13.24%)	9,922 (13.24%)	189,601 (41.84%)	-0.68	<.0001	0.00	0.9818	
Region Rockies	1,176 (1.57%)	1,176 (1.57%)	1,170 (1.56%)	23,909 (5.28%)	-0.20	<.0001	0.00	0.9171	
Admission Conditions									
Pneumonia Due to Anaerobes or Gram-Negative Bacteria	2,155 (2.88%)	2,155 (2.88%)	2,155 (2.88%)	11,129 (2.46%)	0.03	<.0001	0.00	1.0000	
Aspiration Pneumonia	14,909 (19.89%)	14,909 (19.89%)	14,909 (19.89%)	79,901 (17.63%)	0.06	<.0001	0.00	1.0000	
Pneumonia Due to H. Influenza	176 (0.23%)	176 (0.23%)	176 (0.23%)	1,297 (0.29%)	-0.01	0.0135	0.00	1.0000	
Legionnaire's Disease	206 (0.27%)	206 (0.27%)	206 (0.27%)	403 (0.09%)	0.04	<.0001	0.00	1.0000	

Variable	All Major Teaching Cases N=74,947	Matched Major Teaching Cases N=74,947	Matched Non-Teaching Controls N=74,947	All Non-Teaching Controls N=453,186	Std. Diff Before Match	P-value Before Match	Std. Diff After Match	P-value After Match
Pneumonia Due to MRSA	1,148 (1.53%)	1,148 (1.53%)	1,148 (1.53%)	8,121 (1.79%)	-0.02	<.0001	0.00	1.0000
Pneumonia, Other	51,556 (68.79%)	51,556 (68.79%)	51,556 (68.79%)	331,408 (73.13%)	-0.10	<.0001	0.00	1.0000
Pneumococcal Pneumonia	774 (1.03%)	774 (1.03%)	774 (1.03%)	4,280 (0.94%)	0.01	0.0221	0.00	1.0000
Pneumonia Due to Pseudomonas	918 (1.22%)	918 (1.22%)	918 (1.22%)	5,405 (1.19%)	0.00	0.4573	0.00	1.0000
Streptococcal Pneumoniae	233 (0.31%)	233 (0.31%)	233 (0.31%)	1,427 (0.31%)	0.00	0.8880	0.00	1.0000
Staphylococcal Pneumonia	75 (0.10%)	75 (0.10%)	75 (0.10%)	498 (0.11%)	0.00	0.4728	0.00	1.0000
Viral Pneumonia	2,797 (3.73%)	2,797 (3.73%)	2,797 (3.73%)	9,317 (2.06%)	0.10	<.0001	0.00	1.0000
Comorbidities								
History of PTCA	3,821 (5.10%)	3,821 (5.10%)	3,912 (5.22%)	23,310 (5.14%)	0.00	0.6107	-0.01	0.2933
History of CABG	4,224 (5.64%)	4,224 (5.64%)	4,219 (5.63%)	28,172 (6.22%)	-0.02	<.0001	0.00	0.9643
Heart Failure	24,019 (32.05%)	24,019 (32.05%)	24,454 (32.63%)	137,172 (30.27%)	0.04	<.0001	-0.01	0.0166
Myocardial Infarction	1,294 (1.73%)	1,294 (1.73%)	1,069 (1.43%)	6,609 (1.46%)	0.02	<.0001	0.02	<.0001
Unstable Angina	3,477 (4.64%)	3,477 (4.64%)	3,082 (4.11%)	14,875 (3.28%)	0.07	<.0001	0.03	<.0001
Cardio-respiratory Failure or Shock	13,672 (18.24%)	13,672 (18.24%)	13,937 (18.60%)	86,943 (19.18%)	-0.02	<.0001	-0.01	0.0786
Valvular Heart Disease	16,945 (22.61%)	16,945 (22.61%)	17,351 (23.15%)	99,358 (21.92%)	0.02	<.0001	-0.01	0.0128
Hypertension	65,168 (86.95%)	65,168 (86.95%)	64,978 (86.70%)	391,800 (86.45%)	0.01	0.0002	0.01	0.1489
Stroke	8,340 (11.13%)	8,340 (11.13%)	9,561 (12.76%)	42,637 (9.41%)	0.06	<.0001	-0.05	<.0001
Cerebrovascular Disease	15,434 (20.59%)	15,434 (20.59%)	16,502 (22.02%)	87,483 (19.30%)	0.03	<.0001	-0.04	<.0001
Renal Failure	20,895 (27.88%)	20,895 (27.88%)	20,129 (26.86%)	112,634 (24.85%)	0.07	<.0001	0.02	<.0001
COPD	32,862 (43.85%)	32,862 (43.85%)	32,993 (44.02%)	235,793 (52.03%)	-0.16	<.0001	0.00	0.4987
Pneumonia; pleural effusion/pneumothorax	59,720 (79.68%)	59,720 (79.68%)	61,347 (81.85%)	374,648 (82.67%)	-0.08	<.0001	-0.06	<.0001
Diabetes	31,822 (42.46%)	31,822 (42.46%)	30,905 (41.24%)	183,771 (40.55%)	0.04	<.0001	0.02	<.0001
Malnutrition	11,665 (15.56%)	11,665 (15.56%)	11,371 (15.17%)	64,302 (14.19%)	0.04	<.0001	0.01	0.0359
Dementia or other specified brain disorders	27,706 (36.97%)	27,706 (36.97%)	27,600 (36.83%)	160,009 (35.31%)	0.03	<.0001	0.00	0.5741
Hemiplegia, paraplegia, paralysis, functional disability	8,731 (11.65%)	8,731 (11.65%)	9,992 (13.33%)	44,496 (9.82%)	0.06	<.0001	-0.05	<.0001
Vascular disease and complications	26,110 (34.84%)	26,110 (34.84%)	26,195 (34.95%)	132,570 (29.25%)	0.12	<.0001	0.00	0.6490
Cancer	8,711 (11.62%)	8,711 (11.62%)	8,297 (11.07%)	40,842 (9.01%)	0.09	<.0001	0.02	0.0008
Trauma; other injuries	26,467 (35.31%)	26,467 (35.31%)	26,744 (35.68%)	152,548 (33.66%)	0.03	<.0001	-0.01	0.1363
Major psychiatric disorders	12,428 (16.58%)	12,428 (16.58%)	11,647 (15.54%)	70,679 (15.60%)	0.03	<.0001	0.03	<.0001
Chronic Liver Disease	2,047 (2.73%)	2,047 (2.73%)	1,707 (2.28%)	8,865 (1.96%)	0.05	<.0001	0.03	<.0001
Severe hematological disorders	1,951 (2.60%)	1,951 (2.60%)	1,345 (1.79%)	8,981 (1.98%)	0.04	<.0001	0.05	<.0001
Iron deficiency or other/unspecified anemias and blood disease	45,187 (60.29%)	45,187 (60.29%)	46,026 (61.41%)	256,867 (56.68%)	0.07	<.0001	-0.02	<.0001
Depression	19,008 (25.36%)	19,008 (25.36%)	17,941 (23.94%)	109,638 (24.19%)	0.03	<.0001	0.03	<.0001
Parkinson's and Huntington's diseases	4,088 (5.45%)	4,088 (5.45%)	4,255 (5.68%)	23,170 (5.11%)	0.02	0.0001	-0.01	0.0615
Seizure disorders and convulsions	5,846 (7.80%)	5,846 (7.80%)	5,066 (6.76%)	28,437 (6.27%)	0.06	<.0001	0.04	<.0001
Fibrosis of lung or other chronic lung disorders	9,492 (12.66%)	9,492 (12.66%)	10,074 (13.44%)	61,054 (13.47%)	-0.02	<.0001	-0.02	<.0001

Variable	All Major Teaching Cases N=74,947	Matched Major Teaching Cases N=74,947	Matched Non-Teaching Controls N=74,947	All Non-Teaching Controls N=453,186	Std. Diff Before Match	P-value Before Match	Std. Diff After Match	P-value After Match
Asthma	8,940 (11.93%)	8,940 (11.93%)	9,105 (12.15%)	47,771 (10.54%)	0.04	<.0001	-0.01	0.1930
Predicted Risk								
30-Day Mortality Risk Quintile 1	13,975 (18.65%)	13,975 (18.65%)	13,975 (18.65%)	91,649 (20.22%)	-0.04	<.0001	0.00	1.0000
30-Day Mortality Risk Quintile 2	13,888 (18.53%)	13,888 (18.53%)	13,888 (18.53%)	91,371 (20.16%)	-0.04	<.0001	0.00	1.0000
30-Day Mortality Risk Quintile 3	14,904 (19.89%)	14,904 (19.89%)	14,904 (19.89%)	91,091 (20.10%)	-0.01	0.1758	0.00	1.0000
30-Day Mortality Risk Quintile 4	15,279 (20.39%)	15,279 (20.39%)	15,279 (20.39%)	90,342 (19.93%)	0.01	0.0043	0.00	1.0000
30-Day Mortality Risk Quintile 5	16,901 (22.55%)	16,901 (22.55%)	16,901 (22.55%)	88,733 (19.58%)	0.07	<.0001	0.00	1.0000
Mean 30-day mortality risk quintile	3.1	3.1	3.1	3.0	0.08	<.0001	0.00	1.0000
Mean ICU risk quintile	3.1	3.1	3.1	3.0	0.11	<.0001	0.02	0.0040
Mean LOS risk quintile	3.1	3.1	3.1	3.0	0.11	<.0001	0.02	0.0021
Mean cost risk quintile	3.2	3.2	3.1	3.0	0.13	<.0001	0.02	0.0002
Risk score for 30-Day Mortality (mean)	14.5%	14.5%	14.4%	13.4%	0.09	<.0001	0.00	0.8054
Predicted ICU Utilization (mean)	36.0%	36.0%	35.9%	34.9%	0.12	<.0001	0.01	0.0019
Predicted LOS (mean)	5.0	5.0	5.0	4.9	0.10	<.0001	0.01	0.0006
Predicted Cost (mean)	12,983	12,983	12,933	12,572	0.13	<.0001	0.02	0.0001
Hospital Characteristics (Not Included in Matching Algorithm)								
Total Beds	558.1	558.1	221.8	224.2	1.13	<.0001	1.14	<.0001
Size Small (≤ 100 beds)	947 (1.26%)	947 (1.26%)	16,762 (22.37%)	120,774 (26.65%)	-0.79	<.0001	-0.65	<.0001
Size Medium (>100 to ≤ 250 beds)	10,428 (13.91%)	10,428 (13.91%)	32,861 (43.85%)	178,844 (39.46%)	-0.60	<.0001	-0.71	<.0001
Size Large (>250 beds)	63,572 (84.82%)	63,572 (84.82%)	25,324 (33.79%)	153,568 (33.89%)	1.21	<.0001	1.22	<.0001
COTH Member	51,492 (68.70%)	51,492 (68.70%)	--	--	--	--	--	--
RB Ratio (mean)	0.50	0.50	0.00	0.00	2.93	<.0001	2.92	<.0001
Very Major Teaching Hospital ($0.60 \leq RB$)	21,541 (28.74%)	21,541 (28.74%)	--	--	--	--	--	--
Major Teaching Hospital ($0.25 < RB < 0.60$)	53,406 (71.26%)	53,406 (71.26%)	--	--	--	--	--	--
Minor Teaching Hospital ($0.05 < RB \leq 0.25$)	--	--	--	--	--	--	--	--
Very Minor Teaching Hospital ($0.0 < RB \leq 0.05$)	--	--	14,273 (19.04%)	78,063 (17.23%)	--	--	--	--
Nonteaching Hospital ($RB = 0$)	--	--	60,674 (80.96%)	375,123 (82.77%)	--	--	--	--
NB Ratio (mean)	1.67	1.67	1.44	1.37	0.10	<.0001	0.08	<.0001
NB Ratio High ($1.0 \leq NB$)	63,955 (85.33%)	63,955 (85.33%)	53,267 (71.07%)	310,924 (68.61%)	0.41	<.0001	0.35	<.0001
NB Ratio Moderate ($0.5 \leq NB < 1.0$)	8,343 (11.13%)	8,343 (11.13%)	16,845 (22.48%)	108,686 (23.98%)	-0.34	<.0001	-0.30	<.0001
NB Ratio Low ($NB < 0.5$)	2,646 (3.53%)	2,646 (3.53%)	4,173 (5.57%)	30,557 (6.74%)	-0.15	<.0001	-0.09	<.0001
NB Ratio Missing	--	--	662 (0.88%)	3,019 (0.67%)	--	--	--	--
Nurse-Mix (mean)	0.94	0.94	0.90	0.88	0.48	<.0001	0.34	<.0001
Nurse-Mix High ($90 < \% RN$)	64,231 (85.70%)	64,231 (85.70%)	47,079 (62.82%)	258,558 (57.05%)	0.67	<.0001	0.53	<.0001
Nurse-Mix Moderate ($75 \leq \% RN \leq 90$)	8,253 (11.01%)	8,253 (11.01%)	20,603 (27.49%)	133,159 (29.38%)	-0.47	<.0001	-0.42	<.0001
Nurse-Mix Low ($\% RN < 75$)	2,097 (2.80%)	2,097 (2.80%)	6,074 (8.10%)	56,068 (12.37%)	-0.37	<.0001	-0.20	<.0001

Variable	All Major Teaching Cases N=74,947	Matched Major Teaching Cases N=74,947	Matched Non-Teaching Controls N=74,947	All Non-Teaching Controls N=453,186	Std. Diff Before Match	P-value Before Match	Std. Diff After Match	P-value After Match
Nurse-Mix Missing	366 (0.49%)	366 (0.49%)	1,191 (1.59%)	5,401 (1.19%)	-0.08	<.0001	-0.12	<.0001
High Technology Hospital	43,558 (58.12%)	43,558 (58.12%)	14,039 (18.90%)	94,622 (21.02%)	0.82	<.0001	0.87	<.0001
Dual-Eligible	17,610 (23.50%)	17,610 (23.50%)	16,517 (22.04%)	100,956 (22.28%)	0.03	<.0001	0.03	<.0001

“--” indicates a blank cell.

Appendix Table 10. Readmission Results using alternative definitions of readmission, with and without the compound definition of readmission and death. Method A is a paired analysis starting at admission. Method B is a paired analysis starting at discharge. Method C is a grouped analysis. Subscript 1 denotes the compound outcome or readmission and death, Subscript 2 denotes the outcome of just readmission.

Outcome (% unless noted)	Cohort	AMI N=43,990 Pairs	HF N=84,985 Pairs	PNA N=74,947 Pairs	Combined Patients N=203,922 Pairs	Combined Quintiles of Risk on Admission (Q1 = Lowest)				
						Q1 N=41,851 Pairs	Q2 N=39,207 Pairs	Q3 N=39,738 Pairs	Q4 N=40,547 Pairs	Q5 N=42,579 Pairs
30-day Readmission or Death (%) METHOD A₁	Teaching	32.9	29.5	30.0	30.4	20.9	25.0	28.2	33.3	44.1
	Nonteaching	36.2	30.9	31.6	32.3	23.6	27.1	29.9	34.8	45.5
	Difference	-3.3 ^d	-1.4 ^d	-1.6 ^d	-1.9 ^d	-2.8 ^d	-2.1 ^d	-1.7 ^d	-1.5 ^d	-1.4 ^d
30-day Readmission (%) METHOD A₂	Teaching	22.4	23.1	19.4	21.6	19.1	21.5	22.1	22.6	22.6
	Nonteaching	25.2	23.8	19.5	22.5	22.0	23.4	23.2	22.8	21.5
	Difference	-2.9 ^d	-0.7 ^c	-0.1	-1.0 ^d	-2.9 ^d	-1.9 ^d	-1.1 ^d	-0.1	1.2 ^d
N Pairs for METHOD B	Cohort	AMI N=37,878 Pairs	HF N=79,921 Pairs	PNA N=67,340 Pairs	Combined Patients N=185,139 Pairs	Q1 N=40,885 Pairs	Q2 N=37,472 Pairs	Q3 N=36,837 Pairs	Q4 N=35,955 Pairs	Q5 N=33,990 Pairs
30-day Readmission or Death (%) METHOD B₁	Teaching	27.1	27.4	25.9	26.8	19.9	23.3	25.4	29.3	37.6
	Nonteaching	31.1	28.7	27.3	28.7	22.8	25.5	27.2	30.6	38.8
	Difference	-4.0 ^d	-1.3 ^d	-1.4 ^d	-1.9 ^d	-2.8 ^d	-2.2 ^d	-1.8 ^d	-1.3 ^d	-1.2 ^c
30-day Readmission (%) METHOD B₂	Teaching	24.0	23.9	20.2	22.6	19.3	22.1	22.9	24.0	25.1
	Nonteaching	27.2	24.6	20.5	23.6	22.2	23.9	24.1	24.2	24.0
	Difference	-3.2 ^d	-0.7 ^c	-0.3	-1.1 ^d	-2.9 ^d	-1.9 ^d	-1.2 ^c	-0.2	1.1 ^b
N Patients for METHOD C	Cohort	AMI Case N=40,673, Control N= 40,803	HF Case N=82,836, Control N=82,388	PNA Case N=71,100, Control N=70,828	Combined Patients Case N=194,159, Control N=194,019	Q1 Case N=41,341 , Control N=41,388	Q2 Case N=38,316, Control N=38,342	Q3 Case N=38,234, Control N=38,262	Q4 Case N=38,186, Control N=38,113	Q5 Case N=38,082, Control N=37,914
30-day Readmission or Death (%) METHOD C₁	Teaching	27.5	27.4	26.3	27.0	20.0	23.3	25.5	29.3	37.8
	Nonteaching	31.3	28.8	27.7	28.9	22.8	25.5	27.2	30.7	38.9
	Difference	-3.8 ^d	-1.4 ^d	-1.4 ^d	-1.9 ^d	-2.8 ^d	-2.2 ^d	-1.7 ^d	-1.4 ^d	-1.1 ^b
30-day Readmission (%) METHOD C₂	Teaching	24.2	23.8	20.4	22.7	19.3	22.0	23.0	24.0	25.3
	Nonteaching	27.2	24.6	20.7	23.7	22.2	24.0	24.1	24.2	24.1
	Difference	-3.0 ^d	-0.8 ^c	-0.3	-1.0 ^d	-2.9 ^d	-2.0 ^d	-1.1 ^c	-0.2	1.2 ^c

P-value key: a: P < 0.05; b: P < 0.01; c: P < 0.001; d: P < 0.0001. Non-significant differences have no letter.

METHOD A: Paired analysis starts with patients on admission. **METHOD B:** Paired analysis starts only with patients who were discharged alive. If any member of the pair died before discharge, the entire pair is dropped from the analysis. **METHOD C:** Unpaired Analysis

Appendix Table 11. Results for Combined Medical Conditions See Appendix Table 6 for detailed descriptions of each of the payment definitions.

Outcome (% unless noted)	Cohort	All Patients N=203,922 Pairs	Quintiles of Risk on Admission (Q1 = Lowest)					Trend P-value*
			Q1 N=41,851 Pairs	Q2 N=39,207 Pairs	Q3 N=39,738 Pairs	Q4 N=40,547 Pairs	Q5 N=42,579 Pairs	
	% of Pairs	100%	20.5%	19.2%	19.5%	19.9%	20.9%	
30-Day Mortality (%)	Teach. Hosp. Patients	10.7%	2.5%	4.8%	7.9%	13.1%	24.6%	0.0001
	Nonteaching Controls	12.0%	2.6%	5.4%	8.9%	14.9%	27.6%	
	Difference in Outcome	-1.3%	-0.1%	-0.6%	-0.9%	-1.8%	-3.0%	
	P-value	<.0001	0.4670	0.0001	<.0001	<.0001	<.0001	
ICU or Intermediate Care Use (%)	Teach. Hosp. Patients	45.7%	42.8%	45.2%	45.1%	46.4%	48.8%	0.0443
	Nonteaching Controls	50.9%	49.9%	50.9%	50.1%	50.6%	52.8%	
	Difference in Outcome	-5.2%	-7.1%	-5.7%	-4.9%	-4.3%	-4.0%	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
ICU Use (%)	Teach. Hosp. Patients	19.9%	16.6%	19.6%	19.8%	20.7%	22.7%	0.0921
	Nonteaching Controls	22.4%	18.6%	22.3%	22.5%	23.0%	25.3%	
	Difference in Outcome	-2.5%	-2.0%	-2.7%	-2.7%	-2.3%	-2.6%	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
30-day Readmission or Death (%)	Teach. Hosp. Patients	30.4%	20.9%	25.0%	28.2%	33.3%	44.1%	0.0003
	Nonteaching Controls	32.3%	23.6%	27.1%	29.9%	34.8%	45.5%	
	Difference in Outcome	-1.9%	-2.8%	-2.1%	-1.7%	-1.5%	-1.4%	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
Length of Stay (days, m-estimate)	Teach. Hosp. Patients	5.5	4.5	5.0	5.4	5.9	6.8	0.6208
	Nonteaching Controls	5.1	4.1	4.6	4.9	5.4	6.3	
	Difference in Outcome	0.4	0.4	0.4	0.4	0.4	0.5	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
30-day Resource Cost (\$, m-estimate)	Teach. Hosp. Patients	19,249	16,464	18,378	19,041	20,051	22,265	<.0001
	Nonteaching Controls	18,944	17,000	18,489	18,848	19,450	20,901	
	Difference in Outcome	273	-546	-140	182	557	1,289	
	P-value	<.0001	<.0001	0.2904	0.1643	<.0001	<.0001	
30-day Payments Total (\$, m-estimate)	Teach. Hosp. Patients	22,304	21,075	22,125	21,863	22,490	23,913	<.0001
	Nonteaching Controls	17,141	16,703	17,420	17,044	16,899	17,624	
	Difference in Outcome	5,048	4,277	4,629	4,715	5,431	6,120	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
30-day Payments Without Geography (\$, m-estimate)	Teach. Hosp. Patients	21,923	20,788	21,788	21,490	22,075	23,443	<.0001
	Nonteaching Controls	17,166	16,779	17,476	17,077	16,904	17,593	
	Difference in Outcome	4,651	3,915	4,242	4,316	5,024	5,694	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
30-day Payments Without IME (\$, m-estimate)	Teach. Hosp. Patients	19,821	18,703	19,669	19,439	19,991	21,265	<.0001
	Nonteaching Controls	16,898	16,423	17,113	16,794	16,694	17,449	
	Difference in Outcome	2,858	2,237	2,505	2,593	3,192	3,713	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
30-day Payments Without DSH (\$, m-estimate)	Teach. Hosp. Patients	20,888	19,623	20,737	20,493	21,089	22,447	<.0001
	Nonteaching Controls	16,455	15,986	16,725	16,382	16,247	16,926	
	Difference in Outcome	4,332	3,566	3,942	4,028	4,708	5,360	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
30-day Payments Without Geography or IME (\$, m- estimate)	Teach. Hosp. Patients	19,450	18,416	19,327	19,067	19,584	20,810	<.0001
	Nonteaching Controls	16,923	16,497	17,164	16,834	16,694	17,415	
	Difference in Outcome	2,468	1,880	2,126	2,198	2,791	3,295	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
30-day Payments Without Geography or DSH (\$, m- estimate)	Teach. Hosp. Patients	20,515	19,335	20,395	20,125	20,685	21,981	<.0001
	Nonteaching Controls	16,476	16,056	16,777	16,413	16,254	16,896	
	Difference in Outcome	3,938	3,205	3,557	3,631	4,306	4,937	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
	Teach. Hosp. Patients	17,902	16,855	17,786	17,587	18,045	19,197	<.0001
	Nonteaching Controls	16,207	15,746	16,431	16,145	16,001	16,671	

Outcome (% unless noted)	Cohort	All Patients N=203,922 Pairs	Quintiles of Risk on Admission (Q1 = Lowest)					Trend P-value*
			Q1 N=41,851 Pairs	Q2 N=39,207 Pairs	Q3 N=39,738 Pairs	Q4 N=40,547 Pairs	Q5 N=42,579 Pairs	
30-day Payments Without Geo, IME, or DSH (\$, m-estimate)	Difference in Outcome	1,662	1,086	1,349	1,420	1,972	2,440	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	

P-values for binary outcomes overall and within strata were calculated using McNemar's test. P-values and estimates for continuous outcomes overall and within strata were calculated using M-statistics.

*Trends for binary outcomes were tested using the Mantel test for trend, while trends for continuous outcomes were tested using robust regression.

Appendix Table 11a. Results for Matched AMI Pairs See Appendix Table 6 for detailed descriptions of each of the payment definitions.

Outcome (% unless noted)	Cohort	All Patients N=43,990 Pairs	Quintiles of Risk on Admission (Q1 = Lowest)					Trend P-value*
			Q1 N=7,908 Pairs	Q2 N=8,516 Pairs	Q3 N=8,650 Pairs	Q4 N=9,273 Pairs	Q5 N=9,643 Pairs	
	% of Pairs	100.0%	18.0%	19.4%	19.7%	21.1%	21.9%	
30-Day Mortality (%)	Teach. Hosp. Patients	12.1%	2.8%	5.3%	8.6%	14.4%	26.5%	0.0014
	Nonteaching Controls	12.9%	2.9%	5.5%	9.5%	15.2%	28.6%	
	Difference in Outcome	-0.9%	-0.1%	-0.2%	-0.8%	-0.9%	-2.1%	
	P-value	<.0001	0.8481	0.4762	0.0518	0.1003	0.0009	
ICU or Stepdown Use (%)	Teach. Hosp. Patients	70.0%	65.8%	71.6%	71.5%	70.6%	70.1%	0.0012
	Nonteaching Controls	75.3%	73.1%	76.9%	76.9%	74.9%	74.5%	
	Difference in Outcome	-5.3%	-7.3%	-5.3%	-5.4%	-4.3%	-4.4%	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
ICU Use (%)	Teach. Hosp. Patients	46.8%	39.1%	49.0%	49.2%	47.9%	48.0%	0.0176
	Nonteaching Controls	48.7%	42.4%	50.8%	51.9%	49.1%	48.9%	
	Difference in Outcome	-2.0%	-3.4%	-1.8%	-2.6%	-1.2%	-1.0%	
	P-value	<.0001	<.0001	0.0128	0.0002	0.0663	0.1333	
30-day Readmission or Death (%)	Teach. Hosp. Patients	32.9%	21.4%	26.0%	30.3%	37.0%	46.7%	< .0001
	Nonteaching Controls	36.2%	27.3%	31.3%	34.1%	38.1%	47.9%	
	Difference in Outcome	-3.3%	-5.9%	-5.3%	-3.8%	-1.1%	-1.2%	
	P-value	<.0001	<.0001	<.0001	<.0001	0.1287	0.0906	
Length of Stay (days, m-estimate)	Teach. Hosp. Patients	5.3	4.0	4.8	5.3	5.9	6.5	0.6979
	Nonteaching Controls	4.6	3.5	4.1	4.6	5.0	5.6	
	Difference in Outcome	0.7	0.5	0.6	0.7	0.9	0.9	
	P-value	< .0001	< .0001	< .0001	< .0001	< .0001	< .0001	
30-day Resource Cost (\$, m-estimate)	Teach. Hosp. Patients	23,875	19,339	23,144	24,614	25,543	26,154	<.0001
	Nonteaching Controls	23,327	20,426	23,744	24,493	23,946	23,815	
	Difference in Outcome	489	-1,060	-581	110	1,438	2,222	
	P-value	0.0013	0.0005	0.0943	0.7569	<.0001	<.0001	
30-day Payments Total (\$, m-estimate)	Teach. Hosp. Patients	29,930	28,325	30,824	30,675	30,496	29,390	< .0001
	Nonteaching Controls	24,060	24,418	26,055	25,583	23,054	21,544	
	Difference in Outcome	5,795	3,800	4,780	5,019	7,241	7,681	
	P-value	< .0001	< .0001	< .0001	< .0001	< .0001	< .0001	
30-day Payments Without Geography (\$, m-estimate)	Teach. Hosp. Patients	29,403	27,954	30,323	30,106	29,905	28,778	<.0001
	Nonteaching Controls	24,124	24,541	26,155	25,646	23,088	21,519	
	Difference in Outcome	5,218	3,307	4,185	4,422	6,628	7,090	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
30-day Payments Without IME (\$, m-estimate)	Teach. Hosp. Patients	26,446	24,989	27,226	27,072	26,900	26,023	< .0001
	Nonteaching Controls	23,416	23,635	25,281	24,915	22,497	21,148	
	Difference in Outcome	2,966	1,296	1,979	2,160	4,254	4,723	
	P-value	< .0001	< .0001	< .0001	< .0001	< .0001	< .0001	
30-day Payments Without DSH (\$, m-estimate)	Teach. Hosp. Patients	27,975	26,398	28,817	28,718	28,494	27,440	< .0001
	Nonteaching Controls	23,035	23,363	24,979	24,535	22,132	20,639	
	Difference in Outcome	4,865	2,965	3,892	4,130	6,241	6,673	
	P-value	< .0001	< .0001	< .0001	< .0001	< .0001	< .0001	
30-day Payments Without Geography or IME (\$, m- estimate)	Teach. Hosp. Patients	25,936	24,626	26,730	26,553	26,333	25,423	<.0001
	Nonteaching Controls	23,476	23,787	25,377	24,969	22,520	21,151	
	Difference in Outcome	2,403	813	1,396	1,578	3,675	4,144	
	P-value	<.0001	0.0070	<.0001	<.0001	<.0001	<.0001	
30-day Payments Without Geography or DSH (\$, m- estimate)	Teach. Hosp. Patients	27,450	26,028	28,311	28,177	27,903	26,833	<.0001
	Nonteaching Controls	23,099	23,496	25,073	24,583	22,152	20,622	
	Difference in Outcome	4,295	2,474	3,301	3,539	5,643	6,085	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
	Teach. Hosp. Patients	23,784	22,559	24,556	24,403	24,210	23,277	<.0001
	Nonteaching Controls	22,437	22,698	24,222	23,860	21,582	20,193	

Outcome (% unless noted)	Cohort	All Patients N=43,990 Pairs	Quintiles of Risk on Admission (Q1 = Lowest)					Trend P-value*
			Q1 N=7,908 Pairs	Q2 N=8,516 Pairs	Q3 N=8,650 Pairs	Q4 N=9,273 Pairs	Q5 N=9,643 Pairs	
30-day Payments Without Geo, IME, or DSH (\$, m-estimate)	Difference in Outcome P-value	1,332 <.0001	-145 0.6052	359 0.2353	551 0.0656	2,520 <.0001	2,981 <.0001	

P-values for binary outcomes overall and within strata were calculated using McNemar's test. P-values and estimates for continuous outcomes overall and within strata were calculated using M-statistics.
*Trends for binary outcomes were tested using the Mantel test for trend, while trends for continuous outcomes were tested using robust regression.

Appendix Table 11b. Results for Matched HF Pairs See Appendix Table 6 for detailed descriptions of each of the payment definitions.

Outcome (% unless noted)	Cohort	All Patients N=84,985 Pairs	Quintiles of Risk on Admission (Q1 = Lowest)					Trend P- value*
			Q1 N=19,968 Pairs	Q2 N=16,803 Pairs	Q3 N=16,184 Pairs	Q4 N=15,995 Pairs	Q5 N=16,035 Pairs	
	% of Pairs	100.0%	23.5%	19.8%	19.0%	18.8%	18.9%	
30-Day Mortality (%)	Teach. Hosp. Patients	8.3%	2.5%	4.5%	7.0%	10.4%	18.7%	<.0001
	Nonteaching Controls	9.3%	2.6%	5.1%	7.4%	12.0%	21.4%	
	Difference in Outcome	-1.0%	-0.1%	-0.6%	-0.5%	-1.6%	-2.6%	
	P-value	<.0001	0.3913	0.0097	0.0941	<.0001	<.0001	
ICU or Stepdown Use (%)	Teach. Hosp. Patients	45.8%	45.0%	45.5%	45.2%	46.3%	47.3%	<.0001
	Nonteaching Controls	52.1%	53.6%	52.4%	51.3%	51.1%	51.5%	
	Difference in Outcome	-6.3%	-8.6%	-7.0%	-6.0%	-4.9%	-4.3%	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
ICU Use (%)	Teach. Hosp. Patients	13.8%	13.8%	13.5%	12.9%	13.5%	15.1%	0.0016
	Nonteaching Controls	16.1%	14.7%	16.3%	15.8%	16.0%	17.9%	
	Difference in Outcome	-2.3%	-1.0%	-2.9%	-2.8%	-2.5%	-2.8%	
	P-value	<.0001	0.0062	<.0001	<.0001	<.0001	<.0001	
30-day Readmission or Death (%)	Teach. Hosp. Patients	29.5%	23.6%	26.6%	28.7%	31.3%	39.1%	0.0190
	Nonteaching Controls	30.9%	25.8%	28.2%	29.7%	32.6%	39.6%	
	Difference in Outcome	-1.4%	-2.1%	-1.6%	-1.0%	-1.3%	-0.5%	
	P-value	<.0001	<.0001	0.0009	0.0573	0.0102	0.3451	
Length of Stay (days, m-estimate)	Teach. Hosp. Patients	5.5	4.9	5.2	5.4	5.7	6.5	0.6020
	Nonteaching Controls	4.9	4.2	4.6	4.8	5.1	5.9	
	Difference in Outcome	0.6	0.6	0.6	0.6	0.5	0.6	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
30-day Resource Cost (\$, m-estimate)	Teach. Hosp. Patients	19,067	17,755	18,862	18,803	19,281	20,985	<.0001
	Nonteaching Controls	18,267	17,587	18,318	18,117	18,249	19,257	
	Difference in Outcome	756	118	519	689	987	1,623	
	P-value	<.0001	0.5278	0.0112	0.0006	<.0001	<.0001	
30-day Payments Total (\$, m-estimate)	Teach. Hosp. Patients	21,017	21,750	21,597	20,388	20,238	20,883	0.1944
	Nonteaching Controls	15,677	16,467	16,284	15,343	14,953	15,183	
	Difference in Outcome	5,206	5,182	5,237	4,923	5,129	5,526	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
30-day Payments Without Geography (\$, m-estimate)	Teach. Hosp. Patients	20,682	21,457	21,308	20,060	19,890	20,528	0.1532
	Nonteaching Controls	15,704	16,523	16,321	15,363	14,950	15,172	
	Difference in Outcome	4,858	4,825	4,899	4,577	4,781	5,176	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
30-day Payments Without IME (\$, m-estimate)	Teach. Hosp. Patients	18,734	19,327	19,270	18,207	18,071	18,693	0.1300
	Nonteaching Controls	15,495	16,215	16,038	15,170	14,824	15,078	
	Difference in Outcome	3,151	3,049	3,147	2,954	3,117	3,488	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
30-day Payments Without DSH (\$, m-estimate)	Teach. Hosp. Patients	19,704	20,216	20,281	19,166	19,029	19,687	0.0860
	Nonteaching Controls	15,067	15,708	15,629	14,769	14,423	14,660	
	Difference in Outcome	4,530	4,408	4,556	4,298	4,480	4,902	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
30-day Payments Without Geography or IME (\$, m- estimate)	Teach. Hosp. Patients	18,413	19,014	18,975	17,883	17,720	18,327	0.1167
	Nonteaching Controls	15,520	16,278	16,091	15,199	14,813	15,061	
	Difference in Outcome	2,813	2,698	2,816	2,616	2,784	3,145	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
30-day Payments Without Geography or DSH (\$, m- estimate)	Teach. Hosp. Patients	19,385	19,927	19,972	18,844	18,676	19,323	0.0636
	Nonteaching Controls	15,093	15,786	15,666	14,789	14,414	14,654	
	Difference in Outcome	4,186	4,054	4,225	3,954	4,142	4,556	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
	Teach. Hosp. Patients	16,984	17,378	17,511	16,555	16,404	16,989	0.0253
	Nonteaching Controls	14,875	15,524	15,415	14,591	14,238	14,484	

Outcome (% unless noted)	Cohort	All Patients N=84,985 Pairs	Quintiles of Risk on Admission (Q1 = Lowest)					Trend P- value*
			Q1 N=19,968 Pairs	Q2 N=16,803 Pairs	Q3 N=16,184 Pairs	Q4 N=15,995 Pairs	Q5 N=16,035 Pairs	
30-day Payments Without Geo, IME, or DSH (\$, m-estimate)	Difference in Outcome	2,054	1,837	2,058	1,906	2,058	2,429	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	

P-values for binary outcomes overall and within strata were calculated using McNemar's test. P-values and estimates for continuous outcomes overall and within strata were calculated using M-statistics.

*Trends for binary outcomes were tested using the Mantel test for trend, while trends for continuous outcomes were tested using robust regression.

Appendix Table 11c. Results for Matched PNA Pairs See Appendix Table 6 for detailed descriptions of each of the payment definitions.

Outcome (% unless noted)	Cohort	All Patients N=74,947 Pairs	Quintiles of Risk on Admission (Q1 = Lowest)					Trend P- value*
			Q1 N=13,975 Pairs	Q2 N=13,888 Pairs	Q3 N=14,904 Pairs	Q4 N=15,279 Pairs	Q5 N=16,901 Pairs	
	% of Pairs	100.0%	18.6%	18.5%	19.9%	20.4%	22.6%	
30-Day Mortality (%)	Teach. Hosp. Patients	12.7%	2.3%	4.7%	8.5%	15.1%	29.2%	<.0001
	Nonteaching Controls	14.5%	2.4%	5.5%	10.0%	17.6%	33.1%	
	Difference in Outcome	-1.8%	0.0%	-0.8%	-1.5%	-2.5%	-3.9%	
	P-value	<.0001	0.9682	0.0029	<.0001	<.0001	<.0001	
ICU or Stepdown Use (%)	Teach. Hosp. Patients	31.2%	26.6%	28.5%	29.7%	31.8%	38.1%	0.0269
	Nonteaching Controls	35.2%	31.5%	33.0%	33.2%	35.4%	41.5%	
	Difference in Outcome	-3.9%	-4.9%	-4.4%	-3.4%	-3.6%	-3.4%	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
ICU Use (%)	Teach. Hosp. Patients	11.1%	8.0%	8.9%	10.3%	11.7%	15.6%	0.4840
	Nonteaching Controls	14.0%	10.6%	12.1%	12.9%	14.5%	18.8%	
	Difference in Outcome	-2.9%	-2.6%	-3.2%	-2.6%	-2.8%	-3.2%	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
30-day Readmission or Death (%)	Teach. Hosp. Patients	30.0%	16.7%	22.5%	26.4%	33.3%	47.3%	0.2189
	Nonteaching Controls	31.6%	18.5%	23.3%	27.6%	35.1%	49.6%	
	Difference in Outcome	-1.6%	-1.9%	-0.8%	-1.2%	-1.8%	-2.3%	
	P-value	<.0001	<.0001	0.0907	0.0177	0.0008	<.0001	
Length of Stay (days, m-estimate)	Teach. Hosp. Patients	5.7	4.4	5.0	5.4	6.0	7.4	0.0002
	Nonteaching Controls	5.6	4.4	5.0	5.3	5.9	7.0	
	Difference in Outcome	0.1	-0.1	0.0	0.1	0.1	0.3	
	P-value	0.0003	0.2282	0.9933	0.2469	0.0926	<.0001	
30-day Resource Cost (\$, m-estimate)	Teach. Hosp. Patients	16,762	13,005	14,862	16,066	17,627	21,288	<.0001
	Nonteaching Controls	17,143	14,220	15,476	16,420	18,001	20,791	
	Difference in Outcome	-382	-1,167	-656	-323	-356	453	
	P-value	<.0001	<.0001	0.0003	0.0762	0.0653	0.0308	
30-day Payments Total (\$, m-estimate)	Teach. Hosp. Patients	19,314	16,117	17,479	18,416	20,046	23,687	0.0272
	Nonteaching Controls	14,789	12,734	13,609	14,017	15,254	17,752	
	Difference in Outcome	4,435	3,314	3,828	4,316	4,690	5,785	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
30-day Payments Without Geography (\$, m-estimate)	Teach. Hosp. Patients	18,950	15,854	17,166	18,063	19,673	23,216	0.0055
	Nonteaching Controls	14,787	12,780	13,625	14,038	15,232	17,681	
	Difference in Outcome	4,081	3,009	3,498	3,954	4,329	5,378	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
30-day Payments Without IME (\$, m-estimate)	Teach. Hosp. Patients	17,195	14,359	15,566	16,414	17,856	21,045	0.0207
	Nonteaching Controls	14,690	12,649	13,506	13,923	15,158	17,622	
	Difference in Outcome	2,456	1,674	2,046	2,433	2,630	3,343	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
30-day Payments Without DSH (\$, m-estimate)	Teach. Hosp. Patients	18,069	15,021	16,351	17,233	18,785	22,198	0.0031
	Nonteaching Controls	14,206	12,210	13,080	13,476	14,647	17,027	
	Difference in Outcome	3,796	2,751	3,251	3,666	4,036	5,051	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
30-day Payments Without Geography or IME (\$, m- estimate)	Teach. Hosp. Patients	16,841	14,105	15,261	16,067	17,488	20,594	0.0041
	Nonteaching Controls	14,687	12,692	13,528	13,951	15,143	17,555	
	Difference in Outcome	2,109	1,374	1,724	2,082	2,276	2,943	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
30-day Payments Without Geography or DSH (\$, m- estimate)	Teach. Hosp. Patients	17,709	14,753	16,045	16,883	18,416	21,738	0.0003
	Nonteaching Controls	14,206	12,246	13,100	13,505	14,637	16,962	
	Difference in Outcome	3,443	2,446	2,925	3,305	3,677	4,646	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
	Teach. Hosp. Patients	15,503	12,939	14,044	14,782	16,121	19,003	<.0001
	Nonteaching Controls	14,073	12,141	12,971	13,387	14,511	16,790	

Outcome (% unless noted)	Cohort	All Patients N=74,947 Pairs	Quintiles of Risk on Admission (Q1 = Lowest)					Trend P- value*
			Q1 N=13,975 Pairs	Q2 N=13,888 Pairs	Q3 N=14,904 Pairs	Q4 N=15,279 Pairs	Q5 N=16,901 Pairs	
30-day Payments Without Geo, IME, or DSH (\$, m-estimate)	Difference in Outcome	1,408	757	1,089	1,372	1,565	2,130	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	

P-values for binary outcomes overall and within strata were calculated using McNemar's test. P-values and estimates for continuous outcomes overall and within strata were calculated using M-statistics.

*Trends for binary outcomes were tested using the Mantel test for trend, while trends for continuous outcomes were tested using robust regression.

Appendix Table 12. Combined AMI, HF, PNA Value Estimates: expressed as increased dollars at teaching hospitals per 1% change in mortality.

Outcome (% unless noted)	Cohort	Combined Patients N=203,922 Pairs	Combined Quintiles of Risk on Admission (Q1 = Lowest)				
			Q1 N=41,851 Pairs	Q2 N=39,207 Pairs	Q3 N=39,738 Pairs	Q4 N=40,547 Pairs	Q5 N=42,579 Pairs
	% of Pairs	100.0%	20.5%	19.2%	19.5%	19.9%	20.9%
30-Day Mortality (%)	Teach. Hosp. Patients	10.7%	2.5%	4.8%	7.9%	13.1%	24.6%
	Nonteaching Controls	12.0%	2.6%	5.4%	8.9%	14.9%	27.6%
	Difference in Outcome	-1.3%	-0.1%	-0.6%	-0.9%	-1.8%	-3.0%
	P-value	<.0001	0.4670	0.0001	<.0001	<.0001	<.0001
30-day Resource Cost (\$, m-estimate)	Teach. Hosp. Patients	19,249	16,464	18,378	19,041	20,051	22,265
	Nonteaching Controls	18,944	17,000	18,489	18,848	19,450	20,901
	Difference in Outcome	273	-546	-140	182	557	1,289
	P-value	<.0001	<.0001	0.2904	0.1643	<.0001	<.0001
	Value Point Estimate	\$211	N.C.	-\$234	\$193	\$318	\$427
Value 95% CI	(\$119, \$303)	N.C.	(\$-680, \$211)	(\$-102, \$489)	(\$143, \$493)	(\$309, \$546)	
30-day Payments Total (\$, m-estimate)	Teach. Hosp. Patients	22,304	21,075	22,125	21,863	22,490	23,913
	Nonteaching Controls	17,141	16,703	17,420	17,044	16,899	17,624
	Difference in Outcome	5,048	4,277	4,629	4,715	5,431	6,120
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate	\$3,904	N.C.	\$7,755	\$5,010	\$3,097	\$2,030
95% CI	(\$3,336, \$4,472)	N.C.	(\$3,818, \$11,692)	(\$2,929, \$7,091)	(\$2,257, \$3,938)	(\$1,634, \$2,425)	
30-day Payments Without Geography (\$, m-estimate)	Teach. Hosp. Patients	21,923	20,788	21,788	21,490	22,075	23,443
	Nonteaching Controls	17,166	16,779	17,476	17,077	16,904	17,593
	Difference in Outcome	4,651	3,915	4,242	4,316	5,024	5,694
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate	\$3,597	N.C.	\$7,107	\$4,586	\$2,865	\$1,888
95% CI	(\$3,055, \$4,138)	N.C.	(\$3,310, \$10,903)	(\$2,663, \$6,509)	(\$2,068, \$3,662)	(\$1,510, \$2,266)	
30-day Payments Without IME (\$, m-estimate)	Teach. Hosp. Patients	19,821	N.C.	19,669	19,439	19,991	21,265
	Nonteaching Controls	16,898	16,423	17,113	16,794	16,694	17,449
	Difference in Outcome	2,858	2,237	2,505	2,593	3,192	3,713
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate	\$2,210	N.C.	\$4,197	\$2,755	\$1,820	\$1,231
95% CI	(\$1,881, \$2,539)	N.C.	(\$2,025, \$6,369)	(\$1,589, \$3,920)	(\$1,316, \$2,325)	(\$987, \$1,476)	
30-day Payments Without DSH (\$, m-estimate)	Teach. Hosp. Patients	20,888	19,623	20,737	20,493	21,089	22,447
	Nonteaching Controls	16,455	15,986	16,725	16,382	16,247	16,926
	Difference in Outcome	4,332	3,566	3,942	4,028	4,708	5,360
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate	\$3,350	N.C.	\$6,605	\$4,280	\$2,685	\$1,777
95% CI	(\$2,852, \$3,848)	N.C.	(\$3,090, \$10,120)	(\$2,538, \$6,021)	(\$1,966, \$3,403)	(\$1,417, \$2,138)	
30-day Payments	Teach. Hosp. Patients	19,450	18,416	19,327	19,067	19,584	20,810

Outcome (% unless noted)	Cohort	Combined Patients N=203,922 Pairs	Combined Quintiles of Risk on Admission (Q1 = Lowest)				
			Q1 N=41,851 Pairs	Q2 N=39,207 Pairs	Q3 N=39,738 Pairs	Q4 N=40,547 Pairs	Q5 N=42,579 Pairs
Without Geography or IME (\$, m-estimate)	Nonteaching Controls	16,923	16,497	17,164	16,834	16,694	17,415
	Difference in Outcome	2,468	1,880	2,126	2,198	2,791	3,295
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate	\$1,908	N.C.	\$3,562	\$2,335	\$1,592	\$1,093
	95% CI	(\$1,613, \$2,204)	N.C.	(\$1,617, \$5,507)	(\$1,326, \$3,344)	(\$1,137, \$2,047)	(\$870, \$1,316)
30-day Payments Without Geography or DSH (\$, m-estimate)	Teach. Hosp. Patients	20,515	19,335	20,395	20,125	20,685	21,981
	Nonteaching Controls	16,476	16,056	16,777	16,413	16,254	16,896
	Difference in Outcome	3,938	3,205	3,557	3,631	4,306	4,937
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate	\$3,045	N.C.	\$5,960	\$3,858	\$2,455	\$1,637
95% CI	(\$2,585, \$3,506)	N.C.	(\$2,768, \$9,152)	(\$2,233, \$5,482)	(\$1,772, \$3,139)	(\$1,309, \$1,965)	
30-day Payments Without Geo, IME, or DSH (\$, m-estimate)	Teach. Hosp. Patients	17,902	16,855	17,786	17,587	18,045	19,197
	Nonteaching Controls	16,207	15,746	16,431	16,145	16,001	16,671
	Difference in Outcome	1,662	1,086	1,349	1,420	1,972	2,440
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate	\$1,286	N.C.	\$2,259	\$1,509	\$1,125	\$809
95% CI	(\$1,080, \$1,492)	N.C.	(\$990, \$3,529)	(\$832, \$2,185)	(\$796, \$1,453)	(\$641, \$977)	

Note: The variance for the 95% CIs was obtained from 1,000 jackknife samples.

Value is well defined if there is a significant difference in mortality between groups. Otherwise in this table values are reported as N.C. (not calculated). For all value estimates and confidence intervals reported, all 1,000 jackknives concur in finding a statistically significant difference in mortality.

*Positive value estimates indicate higher costs and lower mortality at teaching hospitals, negative value implies lower cost and lower mortality at teaching hospitals.

Appendix Table 12a. AMI Value Estimates: expressed as increased dollars at teaching hospitals per 1% change in mortality.

Outcome (% unless noted)	Cohort	All Patients N=43,990 Pairs	Combined Quintiles of Risk on Admission (Q1 = Lowest)				
			Q1 N=7,908 Pairs	Q2 N=8,516 Pairs	Q3 N=8,650 Pairs	Q4 N=9,273 Pairs	Q5 N=9,643 Pairs
	% of Pairs	100.0%	18.0%	19.4%	19.7%	21.1%	21.9%
30-Day Mortality (%)	Teach. Hosp. Patients	12.1%	2.8%	5.3%	8.6%	14.4%	26.5%
	Nonteaching Controls	12.9%	2.9%	5.5%	9.5%	15.2%	28.6%
	Difference in Outcome	-0.9%	-0.1%	-0.2%	-0.8%	-0.9%	-2.1%
	P-value	<.0001	0.8481	0.4762	0.0518	0.1003	0.0009
30-day Resource Cost (\$, m-estimate)	Teach. Hosp. Patients	23,875	19,339	23,144	24,614	25,543	26,154
	Nonteaching Controls	23,327	20,426	23,744	24,493	23,946	23,815
	Difference in Outcome	489	-1,060	-581	110	1,438	2,222
	P-value	0.0013	0.0005	0.0943	0.7569	<.0001	<.0001
	Value Point Estimate Value 95% CI	\$563 (\$138, \$989)	N.C. N.C.	N.C. N.C.	N.C. N.C.	N.C. N.C.	\$1,045 (\$397, \$1,693)
30-day Payments Total (\$, m-estimate)	Teach. Hosp. Patients	29,930	28,325	30,824	30,675	30,496	29,390
	Nonteaching Controls	24,060	24,418	26,055	25,583	23,054	21,544
	Difference in Outcome	5,795	3,800	4,780	5,019	7,241	7,681
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate 95% CI	\$6,674 (\$3,488, \$9,860)	N.C. N.C.	N.C. N.C.	N.C. N.C.	N.C. N.C.	\$3,613 (\$1,482, \$5,744)
30-day Payments Without Geography (\$, m-estimate)	Teach. Hosp. Patients	29,403	27,954	30,323	30,106	29,905	28,778
	Nonteaching Controls	24,124	24,541	26,155	25,646	23,088	21,519
	Difference in Outcome	5,218	3,307	4,185	4,422	6,628	7,090
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate 95% CI	\$6,008 (\$3,172, \$8,845)	N.C. N.C.	N.C. N.C.	N.C. N.C.	N.C. N.C.	\$3,335 (\$1,435, \$5,235)
30-day Payments Without IME (\$, m-estimate)	Teach. Hosp. Patients	26,446	24,989	27,226	27,072	26,900	26,023
	Nonteaching Controls	23,416	23,635	25,281	24,915	22,497	21,148
	Difference in Outcome	2,966	1,296	1,979	2,160	4,254	4,723
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate 95% CI	\$3,416 (\$1,764, \$5,068)	N.C. N.C.	N.C. N.C.	N.C. N.C.	N.C. N.C.	\$2,222 (\$908, \$3,536)
30-day Payments Without DSH (\$, m-estimate)	Teach. Hosp. Patients	27,975	26,398	28,817	28,718	28,494	27,440
	Nonteaching Controls	23,035	23,363	24,979	24,535	22,132	20,639
	Difference in Outcome	4,865	2,965	3,892	4,130	6,241	6,673
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate 95% CI	\$5,603 (\$2,856, \$8,350)	N.C. N.C.	N.C. N.C.	N.C. N.C.	N.C. N.C.	\$3,139 (\$1,281, \$4,997)
30-day Payments Without Geography	Teach. Hosp. Patients	25,936	24,626	26,730	26,553	26,333	25,423
	Nonteaching Controls	23,476	23,787	25,377	24,969	22,520	21,151

Outcome (% unless noted) or IME (\$, m-estimate)	Cohort	All Patients N=43,990 Pairs	Combined Quintiles of Risk on Admission (Q1 = Lowest)					
			Q1 N=7,908 Pairs	Q2 N=8,516 Pairs	Q3 N=8,650 Pairs	Q4 N=9,273 Pairs	Q5 N=9,643 Pairs	
	Difference in Outcome	2,403	813	1,396	1,578	3,675	4,144	
	P-value	<.0001	0.0070	<.0001	<.0001	<.0001	<.0001	
	Value Point Estimate	\$2,767	N.C.	N.C.	N.C.	N.C.	\$1,949	
	95% CI	(\$1,436, \$4,098)	N.C.	N.C.	N.C.	N.C.	(\$827, \$3,071)	
30-day Payments Without Geography or DSH (\$, m-estimate)	Teach. Hosp. Patients	27,450	26,028	28,311	28,177	27,903	26,833	
	Nonteaching Controls	23,099	23,496	25,073	24,583	22,152	20,622	
	Difference in Outcome	4,295	2,474	3,301	3,539	5,643	6,085	
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	
	Value Point Estimate	\$4,946	N.C.	N.C.	N.C.	N.C.	\$2,862	
	95% CI	(\$2,605, \$7,288)	N.C.	N.C.	N.C.	N.C.	(\$1,230, \$4,494)	
	30-day Payments Without Geo, IME, or DSH (\$, m-estimate)	Teach. Hosp. Patients	23,784	22,559	24,556	24,403	24,210	23,277
		Nonteaching Controls	22,437	22,698	24,222	23,860	21,582	20,193
Difference in Outcome		1,332	-145	359	551	2,520	2,981	
P-value		<.0001	0.6052	0.2353	0.0656	<.0001	<.0001	
	Value Point Estimate	\$1,534	N.C.	N.C.	N.C.	N.C.	\$1,402	
	95% CI	(\$760, \$2,308)	N.C.	N.C.	N.C.	N.C.	(\$585, \$2,220)	

Note: The variance for the 95% CIs was obtained from 1,000 jackknife samples.

Value is well defined if there is a significant difference in mortality between groups. Otherwise in this table values are reported as N.C. (not calculated). For all value estimates and confidence intervals reported, all 1,000 jackknives concur in finding a statistically significant difference in mortality.

*Positive value estimates indicate higher costs and lower mortality at teaching hospitals, negative value implies lower cost and lower mortality at teaching hospitals.

Appendix Table 12b. HF Value Estimates: expressed as increased dollars at teaching hospitals per 1% change in mortality.

Outcome (% unless noted)	Cohort	All Patients N=84,985 Pairs	Combined Quintiles of Risk on Admission (Q1 = Lowest)				
			Q1 N=19,968 Pairs	Q2 N=16,803 Pairs	Q3 N=16,184 Pairs	Q4 N=15,995 Pairs	Q5 N=16,035 Pairs
	% of Pairs	100.0%	23.5%	19.8%	19.0%	18.8%	18.9%
30-Day Mortality (%)	Teach. Hosp. Patients	8.3%	2.5%	4.5%	7.0%	10.4%	18.7%
	Nonteaching Controls	9.3%	2.6%	5.1%	7.4%	12.0%	21.4%
	Difference in Outcome	-1.0%	-0.1%	-0.6%	-0.5%	-1.6%	-2.6%
	P-value	<.0001	0.3913	0.0097	0.0941	<.0001	<.0001
30-day Resource Cost (\$, m-estimate)	Teach. Hosp. Patients	19,067	17,755	18,862	18,803	19,281	20,985
	Nonteaching Controls	18,267	17,587	18,318	18,117	18,249	19,257
	Difference in Outcome	756.32	117.68	518.94	688.53	987.2	1622.94
	P-value	<.0001	0.5278	0.0112	0.0006	<.0001	<.0001
	Value Point Estimate	\$730	N.C.	\$855	N.C.	\$634	\$615
Value 95% CI	(\$465, \$994)	N.C.	(\$101, \$1,810)	N.C.	(\$251, \$1,018)	(\$359, \$871)	
30-day Payments Total (\$, m-estimate)	Teach. Hosp. Patients	21,017	21,750	21,597	20,388	20,238	20,883
	Nonteaching Controls	15,677	16,467	16,284	15,343	14,953	15,183
	Difference in Outcome	5206	5182.34	5236.66	4922.75	5128.53	5526.14
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate	\$5,022	N.C.	\$8,627	N.C.	\$3,294	\$2,095
95% CI	(\$3,729, \$6,315)	N.C.	(\$2,033, \$15,220)	N.C.	(\$1,824, \$4,765)	(\$1,380, \$2,809)	
30-day Payments Without Geography (\$, m-estimate)	Teach. Hosp. Patients	20,682	21,457	21,308	20,060	19,890	20,528
	Nonteaching Controls	15,704	16,523	16,321	15,363	14,950	15,172
	Difference in Outcome	4857.83	4824.62	4898.76	4577.08	4781.29	5176.45
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate	\$4,686	N.C.	\$8,070	N.C.	\$3,071	\$1,962
95% CI	(\$3,477, \$5,895)	N.C.	(\$1,896, \$14,244)	N.C.	(\$1,699, \$4,444)	(\$1,291, \$2,633)	
30-day Payments Without IME (\$, m-estimate)	Teach. Hosp. Patients	18,734	19,327	19,270	18,207	18,071	18,693
	Nonteaching Controls	15,495	16,215	16,038	15,170	14,824	15,078
	Difference in Outcome	3150.7	3048.5	3147.4	2953.91	3117.2	3488.47
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate	\$3,039	N.C.	\$5,185	N.C.	\$2,002	\$1,322
95% CI	(\$2,244, \$3,834)	N.C.	(\$1,190, \$9,180)	N.C.	(\$1,094, \$2,911)	(\$864, \$1,781)	
30-day Payments Without DSH (\$, m-estimate)	Teach. Hosp. Patients	19,704	20,216	20,281	19,166	19,029	19,687
	Nonteaching Controls	15,067	15,708	15,629	14,769	14,423	14,660
	Difference in Outcome	4530.46	4408.15	4555.71	4298.37	4479.93	4901.65
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate	\$4,370	N.C.	\$7,505	N.C.	\$2,878	\$1,858
95% CI	(\$3,279, \$5,461)	N.C.	(\$2,027, \$12,983)	N.C.	(\$1,580, \$4,176)	(\$1,238, \$2,478)	
	Teach. Hosp. Patients	18,413	19,014	18,975	17,883	17,720	18,327

Outcome (% unless noted)	Cohort	All Patients N=84,985 Pairs	Combined Quintiles of Risk on Admission (Q1 = Lowest)				
			Q1 N=19,968 Pairs	Q2 N=16,803 Pairs	Q3 N=16,184 Pairs	Q4 N=15,995 Pairs	Q5 N=16,035 Pairs
30-day Payments Without Geography or IME (\$, m-estimate)	Nonteaching Controls	15,520	16,278	16,091	15,199	14,813	15,061
	Difference in Outcome	2812.91	2697.84	2816.05	2616.18	2783.74	3145.09
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate	\$2,713	N.C.	\$4,639	N.C.	\$1,788	\$1,192
	95% CI	(\$2,000, \$3,427)	N.C.	(\$1,054, \$8,224)	N.C.	(\$971, \$2,605)	(\$777, \$1,607)
30-day Payments Without Geography or DSH (\$, m-estimate)	Teach. Hosp. Patients	19,385	19,927	19,972	18,844	18,676	19,323
	Nonteaching Controls	15,093	15,786	15,666	14,789	14,414	14,654
	Difference in Outcome	4185.51	4053.96	4224.75	3954.24	4141.77	4555.74
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate	\$4,038	N.C.	\$6,960	N.C.	\$2,661	\$1,727
	95% CI	(\$2,993, \$5,082)	N.C.	(\$1,628, \$12,291)	N.C.	(\$1,468, \$3,853)	(\$1,135, \$2,319)
30-day Payments Without Geo, IME, or DSH (\$, m-estimate)	Teach. Hosp. Patients	16,984	17,378	17,511	16,555	16,404	16,989
	Nonteaching Controls	14,875	15,524	15,415	14,591	14,238	14,484
	Difference in Outcome	2053.55	1837.24	2057.84	1905.94	2058.05	2429.21
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate	\$1,981	N.C.	\$3,390	N.C.	\$1,322	\$921
	95% CI	(\$1,451, \$2,511)	N.C.	(\$744, \$6,036)	N.C.	(\$707, \$1,937)	(\$594, \$1,247)

Note: The variance for the 95% CIs was obtained from 1,000 jackknife samples.

Value is well defined if there is a significant difference in mortality between groups. Otherwise in this table values are reported as N.C. (not calculated). For all value estimates and confidence intervals reported, all 1,000 jackknives concur in finding a statistically significant difference in mortality.

*Positive value estimates indicate higher costs and lower mortality at teaching hospitals, negative value implies lower cost and lower mortality at teaching hospitals.

Appendix Table 12c. PNA Value Estimates: expressed as increased dollars at teaching hospitals per 1% change in mortality.

Outcome (% unless noted)	Cohort	All Patients N=74,947	Combined Quintiles of Risk on Admission (Q1 = Lowest)				
			Q1 N=13,975	Q2 N=13,888	Q3 N=14,904	Q4 N=15,279	Q5 N=16,901
	% of Pairs	100.0%	18.6%	18.5%	19.9%	20.4%	22.6%
30-Day Mortality (%)	Teach. Hosp. Patients	12.7%	2.3%	4.7%	8.5%	15.1%	29.2%
	Nonteaching Controls	14.5%	2.4%	5.5%	10.0%	17.6%	33.1%
	Difference in Outcome	-1.8%	0.0%	-0.8%	-1.5%	-2.5%	-3.9%
	P-value	<.0001	0.9682	0.0029	<.0001	<.0001	<.0001
30-day Resource Cost (\$, m-estimate)	Teach. Hosp. Patients	16,762	13,005	14,862	16,066	17,627	21,288
	Nonteaching Controls	17,143	14,220	15,476	16,420	18,001	20,791
	Difference in Outcome	-382	-1,167	-656	-323	-356	453
	P-value	<.0001	<.0001	0.0003	0.0762	0.0653	0.0308
	Value Point Estimate	-\$208	N.C.	-\$821	-\$217	-\$142	\$117
	Value 95% CI	(-\$300, -\$116)	N.C.	(-\$1,442, -\$200)	(-\$459, \$25)	(-\$293, \$9)	(\$2, \$231)
30-day Payments Total (\$, m-estimate)	Teach. Hosp. Patients	19,314	16,117	17,479	18,416	20,046	23,687
	Nonteaching Controls	14,789	12,734	13,609	14,017	15,254	17,752
	Difference in Outcome	4,435	3,314	3,828	4,316	4,690	5,785
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate	\$2,419	N.C.	\$4,789	\$2,897	\$1,871	\$1,490
	95% CI	(\$1,968, \$2,870)	N.C.	(\$1,534, \$8,044)	(\$1,576, \$4,219)	(\$1,217, \$2,525)	(\$1,121, \$1,860)
30-day Payments Without Geography (\$, m-estimate)	Teach. Hosp. Patients	18,950	15,854	17,166	18,063	19,673	23,216
	Nonteaching Controls	14,787	12,780	13,625	14,038	15,232	17,681
	Difference in Outcome	4,081	3,009	3,498	3,954	4,329	5,378
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate	\$2,226	N.C.	\$4,376	\$2,655	\$1,727	\$1,386
	95% CI	(\$1,809, \$2,643)	N.C.	(\$1,392, \$7,361)	(\$1,439, \$3,871)	(\$1,121, \$2,334)	(\$1,042, \$1,729)
30-day Payments Without IME (\$, m-estimate)	Teach. Hosp. Patients	17,195	14,359	15,566	16,414	17,856	21,045
	Nonteaching Controls	14,690	12,649	13,506	13,923	15,158	17,622
	Difference in Outcome	2,456	1,674	2,046	2,433	2,630	3,343
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate	\$1,340	N.C.	\$2,560	\$1,634	\$1,049	\$861
	95% CI	(\$1,083, \$1,597)	N.C.	(\$768, \$4,353)	(\$863, \$2,404)	(\$669, \$1,430)	(\$639, \$1,083)
30-day Payments Without DSH (\$, m-estimate)	Teach. Hosp. Patients	18,069	15,021	16,351	17,233	18,785	22,198
	Nonteaching Controls	14,206	12,210	13,080	13,476	14,647	17,027
	Difference in Outcome	3,796	2,751	3,251	3,666	4,036	5,051
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate	\$2,071	N.C.	\$4,068	\$2,461	\$1,610	\$1,301
	95% CI	(\$1,683, \$2,459)	N.C.	(\$1,292, \$6,844)	(\$1,335, \$3,588)	(\$1,044, \$2,176)	(\$978, \$1,625)
30-day Payments Without	Teach. Hosp. Patients	16,841	14,105	15,261	16,067	17,488	20,594
	Nonteaching Controls	14,687	12,692	13,528	13,951	15,143	17,555

Outcome (% unless noted)	Cohort	All Patients N=74,947	Combined Quintiles of Risk on Admission (Q1 = Lowest)				
			Q1 N=13,975	Q2 N=13,888	Q3 N=14,904	Q4 N=15,279	Q5 N=16,901
Geography or IME (\$, m-estimate)	Difference in Outcome	2,109	1,374	1,724	2,082	2,276	2,943
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate	\$1,150	N.C.	\$2,157	\$1,397	\$908	\$758
	95% CI	(\$926, \$1,374)	N.C.	(\$626, \$3,689)	(\$728, \$2,066)	(\$574, \$1,242)	(\$560, \$957)
30-day Payments Without Geography or DSH (\$, m-estimate)	Teach. Hosp. Patients	17,709	14,753	16,045	16,883	18,416	21,738
	Nonteaching Controls	14,206	12,246	13,100	13,505	14,637	16,962
	Difference in Outcome	3,443	2,446	2,925	3,305	3,677	4,646
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
30-day Payments Without Geo, IME, or DSH (\$, m-estimate)	Value Point Estimate	\$1,878	N.C.	\$3,660	\$2,219	\$1,467	\$1,197
	95% CI	(\$1,525, \$2,231)	N.C.	(\$1,151, \$6,169)	(\$1,197, \$3,240)	(\$949, \$1,985)	(\$898, \$1,496)
	Teach. Hosp. Patients	15,503	12,939	14,044	14,782	16,121	19,003
	Nonteaching Controls	14,073	12,141	12,971	13,387	14,511	16,790
30-day Payments Without Geo, IME, or DSH (\$, m-estimate)	Difference in Outcome	1,408	757	1,089	1,372	1,565	2,130
	P-value	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
	Value Point Estimate	\$768	N.C.	\$1,363	\$921	\$624	\$549
	95% CI	(\$612, \$925)	N.C.	(\$346, \$2,379)	(\$458, \$1,384)	(\$383, \$865)	(\$397, \$700)

Note: The variance for the 95% CIs was obtained from 1,000 jackknife samples.

Value is well defined if there is a significant difference in mortality between groups. Otherwise in this table values are reported as N.C. (not calculated). For all value estimates and confidence intervals reported, all 1,000 jackknives concur in finding a statistically significant difference in mortality.

*Positive value estimates indicate higher costs and lower mortality at teaching hospitals, negative value implies lower cost and lower mortality at teaching hospitals.

Appendix Table 13. Comparison of Cost and Payment Results with and Without Post-Acute-Care (PAC) Payments*: Versions with PAC payments include payments tracked in Skilled Nursing Facility, Hospice, Home Health Agency, and Durable Medical Equipment files.

Outcome (% unless noted)	Cohort	AMI N=43,990 Pairs	HF N=84,98 5 Pairs	PNA N=74,947 Pairs	Combined Patients N=203,922 Pairs	Combined Quintiles of Risk on Admission (Q1 = Lowest)				
						Q1 N=41,851 Pairs	Q2 N=39,207 Pairs	Q3 N=39,738 Pairs	Q4 N=40,547 Pairs	Q5 N=42,579 Pairs
	% of Pairs	21.5	41.7	36.8	100.0	20.5	19.2	19.5	19.9	20.9
30-day Resource Cost without Post-Acute Payments (\$, m-est.)	Teaching	23,875	19,067	16,762	19,249	16,464	18,378	19,041	20,051	22,265
	Nonteaching	23,327	18,267	17,143	18,944	17,000	18,489	18,848	19,450	20,901
	Difference	489 ^d	756 ^d	-382 ^d	273 ^d	-546 ^d	-140	182	557 ^d	1,289 ^d
30-day Resource Cost with PAC Payments (\$, m-est.)	Teaching	28,764	24,989	21,353	24,450	20,245	22,991	24,354	25,883	28,660
	Nonteaching	28,427	24,157	21,806	24,209	21,085	23,335	24,199	25,253	27,084
	Difference	268	765 ^d	-444 ^d	206 ^b	-852 ^d	-365 ^a	136	584 ^c	1,490 ^d
30-day Payments without PAC Payments (\$, m-est.)	Teaching	29,930	21,017	19,314	22,304	21,075	22,125	21,863	22,490	23,913
	Nonteaching	24,060	15,677	14,789	17,141	16,703	17,420	17,044	16,899	17,624
	Difference	5,795 ^d	5,206 ^d	4,435 ^d	5,048 ^d	4,277 ^d	4,629 ^d	4,715 ^d	5,431 ^d	6,120 ^d
30-day Payments with PAC Payments (\$, m-est.)	Teaching	31,931	23,647	21,918	24,790	22,499	24,164	24,503	25,531	27,197
	Nonteaching	25,942	18,188	17,295	19,515	18,031	19,431	19,582	19,787	20,715
	Difference	5,907 ^d	5,341 ^d	4,548 ^d	5,171 ^d	4,369 ^d	4,665 ^d	4,832 ^d	5,579 ^d	6,335 ^d
30-day Payments without PAC Payments, and without Geo, IME, or DSH (\$, m-est.)	Teaching	23,784	16,984	15,503	17,902	16,855	17,786	17,587	18,045	19,197
	Nonteaching	22,437	14,875	14,073	16,207	15,746	16,431	16,145	16,001	16,671
	Difference	1,332 ^d	2,054 ^d	1,408 ^d	1,662 ^d	1,086 ^d	1,349 ^d	1,420 ^d	1,972 ^d	2,440 ^d
30-day Payments with PAC Payments, and without Geo, IME, or DSH (\$, m-est.)	Teaching	25,786	19,632	18,118	20,395	18,252	19,841	20,226	21,090	22,492
	Nonteaching	24,312	17,400	16,576	18,578	17,072	18,439	18,687	18,904	19,766
	Difference	1,447 ^d	2,187 ^d	1,522 ^d	1,785 ^d	1,173 ^d	1,387 ^d	1,534 ^d	2,121 ^d	2,656 ^d

P-value key: a: P < 0.05; b: P < 0.01; c: P < 0.001; d: P < 0.0001. Non-significant differences have no letter.
P-values and estimates for continuous outcomes overall and within strata were calculated using M-statistics. *Trends for continuous outcomes were tested using robust regression.

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