The Association Between Hospital Teaching Status and Outcomes in Patients with Cardiogenic Shock Complicating Acute Myocardial Infarction

NIS Analysis for the RCOP Match Mentorship Program

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## Preamble:

* **Reference Studies:**
  + [Mazhar et al., 2025](https://www.jacc.org/doi/10.1016/S0735-1097%2825%2902056-X)
  + [Sohail et al., 2025](https://www.jacc.org/doi/abs/10.1016/S0735-1097%2825%2902161-8)
* **Study Objective:** To evaluate the association between hospital location/teaching status and in-hospital outcomes among adult patients hospitalized with acute myocardial infarction (AMI) complicated by cardiogenic shock (CS). The goal is to identify potential disparities in mortality, complications, and healthcare resource utilization across rural hospitals, urban non-teaching hospitals, and urban teaching hospitals.
* **Data Source:** Retrospective cross-sectional analysis using the National Inpatient Sample (NIS) from 2018 to 2020. The NIS, part of the Healthcare Cost and Utilization Project (HCUP), provides a stratified, nationally representative sample of U.S. inpatient hospitalizations across all payers and geographic regions.
* **Cohort Definition:** Hospitalizations were included if they met the following criteria
  + Age ≥18 years
  + Diagnosis of **acute myocardial infarction (AMI)**: ICD-10-CM codes I21.0–I21.4 (I21.9 was excluded to avoid unspecified AMI)
  + Concurrent diagnosis of **cardiogenic shock**: ICD-10-CM code R57.0
  + Non-missing values for AMI type and hospital location/teaching status
  + **Exclusions:** Patients who were transferred into the hospital or transferred out to another facility, to ensure full capture of each patient’s complete episode of care
* **Exposure of Interest:** Hospital location and teaching status, categorized as
  + Urban, teaching (reference group)
  + Urban, non-teaching
  + Rural
* **Outcomes of Interest:**
  + **Primary Outcome:**
    - In-hospital mortality
  + **Secondary Outcomes:**
    - Length of stay (LOS), in days
    - Inflation-adjusted total hospital charges (in 2020 USD)
    - Use of mechanical circulatory support (ECMO, IABP, VAD)
    - Diagnosis of acute kidney injury (AKI)
    - Diagnosis of in-hospital stroke
    - Diagnosis of septicemia
* **Outcome Definitions (ICD-10-CM and ICD-10-PCS Codes Used):**
  + Acute Myocardial Infarction (AMI):
    - ICD-10-CM codes I21.0–I21.4
    - I21.9 (unspecified AMI) was excluded
  + Cardiogenic Shock:
    - ICD-10-CM code R57.0
  + Acute Kidney Injury (AKI):
    - ICD-10-CM codes N17.0–N17.9
  + In-Hospital Stroke:
    - Composite of ischemic and hemorrhagic strokes, including:
      * I60.x, I61.x, I62.x, I63.x
      * G43601, G43609, G43611, G43619
      * I97810, I97811, I97820, I97821
      * R297.x
  + Mechanical Circulatory Support (MCS):
    - ICD-10-PCS codes:
      * IABP: 5A02110, 5A02210
      * VAD: 5A02115, 5A02116, 5A0211D, 5A02215, 5A02216, 5A0221D
      * ECMO: 5A0920Z, 5A15223, 5A1522F, 5A1522G, 5A1522H
  + Septicemia:
    - ICD-10-CM codes for septicemia:
      * A021, A207, A227, A267, A327, A392, A393, A394
      * A40.x, A41.x, A427, A5486, B007, B377, I76
      * Obstetric/pregnancy-related: O0337, O0387, O0487, O0737, O0882, O85, O8604
      * Others: R6520, R6521, T8112XA, T8144XA
* **Covariates for Adjustment:** All models adjusted for the following
  + **Demographic Factors:** Age (continuous), sex, race/ethnicity
  + **Socioeconomic Factors:** Primary payer, ZIP code–based income quartile
  + **Clinical Factors:** AMI type (STEMI vs NSTEMI), number of comorbidities (Elixhauser index), APR-DRG risk of mortality score
  + **Hospital-Level Factors:** Hospital region, hospital bed size
* **Statistical Methods:**
  + **Univariable Analysis:**
    - Categorical variables: Compared using Pearson’s chi-square test with Rao & Scott adjustment
    - Continuous variables: Analyzed using the design-based Kruskal–Wallis test, a non-parametric alternative suitable for survey-weighted data
  + **Multivariable Analysis:**
    - Binary outcomes (e.g., mortality, AKI, stroke, sepsis, MCS): Survey-weighted logistic regression using the quasibinomial family
    - Continuous outcomes (e.g., LOS, hospital charges): Survey-weighted linear regression using the gaussian family
    - Results reported as adjusted odds ratios (aORs) or beta coefficients with 95% confidence intervals
* **Software:** All statistical analyses were performed using the R Statistical Language (Version 4.5.0; R Foundation for Statistical Computing, Vienna, Austria), incorporating survey-weighted procedures via the *survey* package to account for the complex sampling design of NIS.

## Baseline Table:

| **Characteristic** | **Overall** N = 91,875*1* | **Urban, teaching** N = 70,590*1* | **Rural** N = 4,345*1* | **Urban, non-teaching** N = 16,940*1* | **p-value***2* |
| --- | --- | --- | --- | --- | --- |
| Age, y | 68 (13) | 68 (13) | 70 (13) | 69 (13) | <0.001 |
| Sex |  |  |  |  | <0.001 |
| Female | 32,315 (35%) | 24,710 (35%) | 1,785 (41%) | 5,820 (34%) |  |
| Male | 59,550 (65%) | 45,870 (65%) | 2,560 (59%) | 11,120 (66%) |  |
| Race |  |  |  |  | <0.001 |
| Asian or Pacific Islander | 4,205 (4.7%) | 3,255 (4.8%) | 30 (0.7%) | 920 (5.6%) |  |
| Black | 9,490 (11%) | 7,845 (11%) | 310 (7.5%) | 1,335 (8.1%) |  |
| Hispanic | 9,825 (11%) | 7,820 (11%) | 90 (2.2%) | 1,915 (12%) |  |
| Other | 4,210 (4.7%) | 3,245 (4.7%) | 80 (1.9%) | 885 (5.3%) |  |
| White | 61,395 (69%) | 46,260 (68%) | 3,630 (88%) | 11,505 (69%) |  |
| Type of MI |  |  |  |  | 0.029 |
| NSTEMI | 43,160 (47%) | 33,020 (47%) | 2,055 (47%) | 8,085 (48%) |  |
| STEMI of anterior wall | 19,100 (21%) | 14,910 (21%) | 790 (18%) | 3,400 (20%) |  |
| STEMI of inferior wall | 19,440 (21%) | 14,675 (21%) | 1,045 (24%) | 3,720 (22%) |  |
| STEMI of other sites | 3,055 (3.3%) | 2,430 (3.4%) | 170 (3.9%) | 455 (2.7%) |  |
| STEMI of unspecified site | 7,120 (7.7%) | 5,555 (7.9%) | 285 (6.6%) | 1,280 (7.6%) |  |
| Insurance payer |  |  |  |  | <0.001 |
| Medicaid | 9,750 (11%) | 7,750 (11%) | 390 (9.0%) | 1,610 (9.5%) |  |
| Medicare | 54,435 (59%) | 41,260 (59%) | 2,805 (65%) | 10,370 (61%) |  |
| Other | 7,925 (8.6%) | 5,980 (8.5%) | 385 (8.9%) | 1,560 (9.2%) |  |
| Private | 19,610 (21%) | 15,460 (22%) | 755 (17%) | 3,395 (20%) |  |
| Income quartile |  |  |  |  | <0.001 |
| $1 - $51,999 | 26,895 (30%) | 20,380 (29%) | 2,470 (58%) | 4,045 (24%) |  |
| $52,000 - $65,999 | 23,605 (26%) | 17,615 (25%) | 1,390 (33%) | 4,600 (28%) |  |
| $66,000 - $87,999 | 21,785 (24%) | 17,140 (25%) | 340 (8.0%) | 4,305 (26%) |  |
| $88,000 or more | 17,820 (20%) | 14,105 (20%) | 70 (1.6%) | 3,645 (22%) |  |
| Hospital region |  |  |  |  | <0.001 |
| Midwest | 18,375 (20%) | 14,450 (20%) | 1,420 (33%) | 2,505 (15%) |  |
| Northeast | 12,810 (14%) | 11,475 (16%) | 350 (8.1%) | 985 (5.8%) |  |
| South | 38,090 (41%) | 27,845 (39%) | 2,180 (50%) | 8,065 (48%) |  |
| West | 22,600 (25%) | 16,820 (24%) | 395 (9.1%) | 5,385 (32%) |  |
| Hospital bedsize |  |  |  |  | <0.001 |
| Large | 49,555 (54%) | 35,010 (50%) | 3,895 (90%) | 10,650 (63%) |  |
| Medium | 27,795 (30%) | 22,575 (32%) | 325 (7.5%) | 4,895 (29%) |  |
| Small | 14,525 (16%) | 13,005 (18%) | 125 (2.9%) | 1,395 (8.2%) |  |
| APR-DRG risk of mortality |  |  |  |  | <0.001 |
| Extreme | 80,585 (88%) | 62,375 (88%) | 3,625 (83%) | 14,585 (86%) |  |
| Major | 9,270 (10%) | 6,875 (9.7%) | 560 (13%) | 1,835 (11%) |  |
| Moderate | 2,020 (2.2%) | 1,340 (1.9%) | 160 (3.7%) | 520 (3.1%) |  |
| No. of comorbidities |  |  |  |  | 0.064 |
| One comorbidity | 9,755 (11%) | 7,305 (10%) | 535 (12%) | 1,915 (11%) |  |
| Two or more comorbidities | 82,120 (89%) | 63,285 (90%) | 3,810 (88%) | 15,025 (89%) |  |
| *1*Mean (SD); n (%) | | | | | |
| *2*Design-based KruskalWallis test; Pearson's X^2: Rao & Scott adjustment | | | | | |

## Univariable Analysis:

| **Characteristic** | **Overall** N = 91,875*1* | **Urban, teaching** N = 70,590*1* | **Rural** N = 4,345*1* | **Urban, non-teaching** N = 16,940*1* | **p-value***2* |
| --- | --- | --- | --- | --- | --- |
| In-hospital mortality | 45,045 (49%) | 34,340 (49%) | 2,240 (52%) | 8,465 (50%) | 0.14 |
| Length of stay (days) | 5 (2, 9) | 5 (2, 9) | 4 (2, 7) | 4 (2, 8) | <0.001 |
| Inflation-adjusted total charge ($) | 144,747 (77,175, 261,467) | 150,095 (80,172, 267,167) | 88,964 (46,521, 152,186) | 140,773 (75,841, 262,205) | <0.001 |
| Acute kidney injury | 49,540 (54%) | 38,535 (55%) | 1,925 (44%) | 9,080 (54%) | <0.001 |
| Sepsis | 18,830 (20%) | 14,465 (20%) | 800 (18%) | 3,565 (21%) | 0.3 |
| In-hospital stroke | 3,585 (3.9%) | 2,910 (4.1%) | 105 (2.4%) | 570 (3.4%) | 0.007 |
| Mechanical circulatory support | 31,350 (34%) | 25,185 (36%) | 1,180 (27%) | 4,985 (29%) | <0.001 |
| *1*n (%); Median (Q1, Q3) | | | | | |
| *2*Pearson's X^2: Rao & Scott adjustment; Design-based KruskalWallis test | | | | | |

## Multivariable Logistic Regression:

### In-hospital Mortality:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Hospital location/teaching status |  |  |  |
| Urban, teaching | — | — |  |
| Rural | 1.20 | 1.01, 1.42 | 0.034 |
| Urban, non-teaching | 1.09 | 1.00, 1.19 | 0.047 |
| Age, y | 1.04 | 1.04, 1.04 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 0.80 | 0.75, 0.86 | <0.001 |
| Race |  |  |  |
| Asian or Pacific Islander | — | — |  |
| Black | 1.19 | 0.99, 1.44 | 0.066 |
| Hispanic | 0.90 | 0.76, 1.08 | 0.3 |
| Other | 1.00 | 0.81, 1.24 | >0.9 |
| White | 1.04 | 0.89, 1.22 | 0.6 |
| Type of MI |  |  |  |
| NSTEMI | — | — |  |
| STEMI of anterior wall | 1.01 | 0.93, 1.11 | 0.8 |
| STEMI of inferior wall | 0.88 | 0.81, 0.96 | 0.004 |
| STEMI of other sites | 1.30 | 1.08, 1.57 | 0.005 |
| STEMI of unspecified site | 2.01 | 1.76, 2.30 | <0.001 |
| Insurance payer |  |  |  |
| Medicaid | — | — |  |
| Medicare | 1.07 | 0.94, 1.21 | 0.3 |
| Other | 1.15 | 0.98, 1.34 | 0.080 |
| Private | 0.81 | 0.71, 0.93 | 0.002 |
| Income quartile |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 0.87 | 0.80, 0.95 | 0.003 |
| $66,000 - $87,999 | 0.95 | 0.87, 1.04 | 0.2 |
| $88,000 or more | 0.80 | 0.73, 0.89 | <0.001 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 1.26 | 1.12, 1.42 | <0.001 |
| South | 1.06 | 0.97, 1.16 | 0.2 |
| West | 1.06 | 0.95, 1.18 | 0.3 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 1.13 | 1.04, 1.22 | 0.003 |
| Small | 1.15 | 1.04, 1.26 | 0.006 |
| APR-DRG risk of mortality |  |  |  |
| Extreme | — | — |  |
| Major | 0.19 | 0.16, 0.22 | <0.001 |
| Moderate | 0.13 | 0.09, 0.19 | <0.001 |
| Elixhauser comorbidity index | 1.10 | 1.08, 1.11 | <0.001 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

### Acute Kidney Injury:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Hospital location/teaching status |  |  |  |
| Urban, teaching | — | — |  |
| Rural | 0.74 | 0.64, 0.87 | <0.001 |
| Urban, non-teaching | 0.99 | 0.91, 1.08 | 0.8 |
| Age, y | 1.02 | 1.01, 1.02 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 1.34 | 1.25, 1.44 | <0.001 |
| Race |  |  |  |
| Asian or Pacific Islander | — | — |  |
| Black | 1.15 | 0.95, 1.40 | 0.2 |
| Hispanic | 0.94 | 0.78, 1.14 | 0.6 |
| Other | 0.87 | 0.70, 1.08 | 0.2 |
| White | 0.94 | 0.79, 1.10 | 0.4 |
| Type of MI |  |  |  |
| NSTEMI | — | — |  |
| STEMI of anterior wall | 0.68 | 0.63, 0.74 | <0.001 |
| STEMI of inferior wall | 0.72 | 0.66, 0.79 | <0.001 |
| STEMI of other sites | 0.76 | 0.63, 0.91 | 0.003 |
| STEMI of unspecified site | 0.81 | 0.72, 0.92 | <0.001 |
| Insurance payer |  |  |  |
| Medicaid | — | — |  |
| Medicare | 0.76 | 0.67, 0.87 | <0.001 |
| Other | 0.93 | 0.80, 1.09 | 0.4 |
| Private | 0.82 | 0.72, 0.93 | 0.002 |
| Income quartile |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 1.10 | 1.01, 1.20 | 0.037 |
| $66,000 - $87,999 | 1.10 | 1.01, 1.21 | 0.038 |
| $88,000 or more | 1.11 | 1.00, 1.23 | 0.048 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 1.19 | 1.06, 1.34 | 0.004 |
| South | 1.08 | 0.98, 1.18 | 0.11 |
| West | 1.02 | 0.92, 1.13 | 0.7 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 1.00 | 0.92, 1.08 | >0.9 |
| Small | 1.01 | 0.92, 1.12 | 0.8 |
| APR-DRG risk of mortality |  |  |  |
| Extreme | — | — |  |
| Major | 0.15 | 0.13, 0.18 | <0.001 |
| Moderate | 0.00 | 0.00, 0.00 | <0.001 |
| Elixhauser comorbidity index | 1.26 | 1.24, 1.28 | <0.001 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

### Septicemia:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Hospital location/teaching status |  |  |  |
| Urban, teaching | — | — |  |
| Rural | 1.01 | 0.82, 1.26 | >0.9 |
| Urban, non-teaching | 1.07 | 0.96, 1.18 | 0.2 |
| Age, y | 1.00 | 1.00, 1.00 | 0.7 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 0.90 | 0.83, 0.97 | 0.009 |
| Race |  |  |  |
| Asian or Pacific Islander | — | — |  |
| Black | 0.96 | 0.78, 1.19 | 0.7 |
| Hispanic | 1.03 | 0.83, 1.26 | 0.8 |
| Other | 1.13 | 0.87, 1.45 | 0.4 |
| White | 0.87 | 0.73, 1.04 | 0.12 |
| Type of MI |  |  |  |
| NSTEMI | — | — |  |
| STEMI of anterior wall | 0.46 | 0.41, 0.51 | <0.001 |
| STEMI of inferior wall | 0.38 | 0.33, 0.43 | <0.001 |
| STEMI of other sites | 0.47 | 0.37, 0.61 | <0.001 |
| STEMI of unspecified site | 0.65 | 0.56, 0.75 | <0.001 |
| Insurance payer |  |  |  |
| Medicaid | — | — |  |
| Medicare | 0.97 | 0.84, 1.13 | 0.7 |
| Other | 0.97 | 0.80, 1.16 | 0.7 |
| Private | 0.84 | 0.72, 0.98 | 0.031 |
| Income quartile |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 0.97 | 0.87, 1.08 | 0.6 |
| $66,000 - $87,999 | 0.92 | 0.82, 1.03 | 0.2 |
| $88,000 or more | 0.86 | 0.75, 0.97 | 0.016 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 1.32 | 1.15, 1.52 | <0.001 |
| South | 1.12 | 1.00, 1.25 | 0.052 |
| West | 1.25 | 1.10, 1.42 | <0.001 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 1.14 | 1.04, 1.25 | 0.005 |
| Small | 1.18 | 1.05, 1.32 | 0.005 |
| APR-DRG risk of mortality |  |  |  |
| Extreme | — | — |  |
| Major | 0.01 | 0.00, 0.03 | <0.001 |
| Moderate | 0.00 | 0.00, 0.00 | <0.001 |
| Elixhauser comorbidity index | 1.14 | 1.12, 1.16 | <0.001 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

### In-hospital Stroke:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Hospital location/teaching status |  |  |  |
| Urban, teaching | — | — |  |
| Rural | 0.71 | 0.46, 1.09 | 0.12 |
| Urban, non-teaching | 0.86 | 0.69, 1.07 | 0.2 |
| Age, y | 0.99 | 0.98, 1.00 | 0.042 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 0.81 | 0.69, 0.94 | 0.008 |
| Race |  |  |  |
| Asian or Pacific Islander | — | — |  |
| Black | 1.14 | 0.78, 1.69 | 0.5 |
| Hispanic | 0.88 | 0.60, 1.30 | 0.5 |
| Other | 0.84 | 0.52, 1.36 | 0.5 |
| White | 0.75 | 0.54, 1.06 | 0.10 |
| Type of MI |  |  |  |
| NSTEMI | — | — |  |
| STEMI of anterior wall | 0.74 | 0.59, 0.94 | 0.012 |
| STEMI of inferior wall | 0.97 | 0.78, 1.21 | 0.8 |
| STEMI of other sites | 0.76 | 0.46, 1.26 | 0.3 |
| STEMI of unspecified site | 1.10 | 0.83, 1.45 | 0.5 |
| Insurance payer |  |  |  |
| Medicaid | — | — |  |
| Medicare | 0.79 | 0.61, 1.03 | 0.082 |
| Other | 1.06 | 0.76, 1.47 | 0.7 |
| Private | 1.00 | 0.76, 1.31 | >0.9 |
| Income quartile |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 0.75 | 0.60, 0.93 | 0.008 |
| $66,000 - $87,999 | 0.94 | 0.76, 1.15 | 0.5 |
| $88,000 or more | 1.02 | 0.81, 1.27 | 0.9 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 1.41 | 1.07, 1.85 | 0.015 |
| South | 1.07 | 0.86, 1.34 | 0.5 |
| West | 1.04 | 0.81, 1.34 | 0.8 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 0.87 | 0.72, 1.05 | 0.14 |
| Small | 1.02 | 0.82, 1.27 | 0.8 |
| APR-DRG risk of mortality |  |  |  |
| Extreme | — | — |  |
| Major | 0.09 | 0.04, 0.20 | <0.001 |
| Moderate | 0.00 | 0.00, 0.00 | <0.001 |
| Elixhauser comorbidity index | 1.10 | 1.07, 1.14 | <0.001 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

### Mechanical Circulatory Support:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Hospital location/teaching status |  |  |  |
| Urban, teaching | — | — |  |
| Rural | 0.62 | 0.51, 0.75 | <0.001 |
| Urban, non-teaching | 0.74 | 0.67, 0.82 | <0.001 |
| Age, y | 0.99 | 0.98, 0.99 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 1.43 | 1.33, 1.54 | <0.001 |
| Race |  |  |  |
| Asian or Pacific Islander | — | — |  |
| Black | 0.63 | 0.52, 0.76 | <0.001 |
| Hispanic | 0.86 | 0.71, 1.04 | 0.12 |
| Other | 0.88 | 0.71, 1.10 | 0.3 |
| White | 0.76 | 0.65, 0.90 | 0.001 |
| Type of MI |  |  |  |
| NSTEMI | — | — |  |
| STEMI of anterior wall | 4.24 | 3.87, 4.63 | <0.001 |
| STEMI of inferior wall | 2.14 | 1.95, 2.34 | <0.001 |
| STEMI of other sites | 3.04 | 2.53, 3.65 | <0.001 |
| STEMI of unspecified site | 1.93 | 1.70, 2.20 | <0.001 |
| Insurance payer |  |  |  |
| Medicaid | — | — |  |
| Medicare | 1.12 | 0.98, 1.27 | 0.088 |
| Other | 1.03 | 0.88, 1.21 | 0.7 |
| Private | 1.22 | 1.08, 1.39 | 0.002 |
| Income quartile |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 1.02 | 0.93, 1.11 | 0.7 |
| $66,000 - $87,999 | 1.06 | 0.96, 1.17 | 0.3 |
| $88,000 or more | 1.07 | 0.96, 1.19 | 0.2 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 0.88 | 0.78, 1.00 | 0.054 |
| South | 0.92 | 0.83, 1.02 | 0.10 |
| West | 0.78 | 0.70, 0.88 | <0.001 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 0.85 | 0.78, 0.93 | <0.001 |
| Small | 0.71 | 0.64, 0.79 | <0.001 |
| APR-DRG risk of mortality |  |  |  |
| Extreme | — | — |  |
| Major | 0.32 | 0.28, 0.36 | <0.001 |
| Moderate | 0.08 | 0.06, 0.12 | <0.001 |
| Elixhauser comorbidity index | 0.95 | 0.94, 0.97 | <0.001 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

## Multivariable Linear Regression:

### Length of Stay:

| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Hospital location/teaching status |  |  |  |
| Urban, teaching | — | — |  |
| Rural | -1.6 | -2.1, -1.2 | <0.001 |
| Urban, non-teaching | -0.73 | -1.1, -0.39 | <0.001 |
| Age, y | -0.06 | -0.08, -0.05 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 0.74 | 0.51, 0.96 | <0.001 |
| Race |  |  |  |
| Asian or Pacific Islander | — | — |  |
| Black | -0.65 | -1.4, 0.12 | 0.10 |
| Hispanic | 0.14 | -0.65, 0.92 | 0.7 |
| Other | -0.59 | -1.4, 0.27 | 0.2 |
| White | -1.1 | -1.8, -0.46 | <0.001 |
| Type of MI |  |  |  |
| NSTEMI | — | — |  |
| STEMI of anterior wall | -1.3 | -1.6, -1.0 | <0.001 |
| STEMI of inferior wall | -2.1 | -2.4, -1.8 | <0.001 |
| STEMI of other sites | -1.7 | -2.2, -1.1 | <0.001 |
| STEMI of unspecified site | -2.3 | -2.7, -1.9 | <0.001 |
| Insurance payer |  |  |  |
| Medicaid | — | — |  |
| Medicare | -1.7 | -2.3, -1.1 | <0.001 |
| Other | -1.2 | -1.9, -0.56 | <0.001 |
| Private | -1.0 | -1.6, -0.46 | <0.001 |
| Income quartile |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 0.42 | 0.12, 0.73 | 0.007 |
| $66,000 - $87,999 | 0.39 | 0.07, 0.71 | 0.018 |
| $88,000 or more | 0.49 | 0.16, 0.82 | 0.004 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 1.3 | 0.86, 1.7 | <0.001 |
| South | 0.49 | 0.18, 0.80 | 0.002 |
| West | -0.10 | -0.47, 0.27 | 0.6 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | -0.88 | -1.2, -0.59 | <0.001 |
| Small | -1.2 | -1.5, -0.86 | <0.001 |
| APR-DRG risk of mortality |  |  |  |
| Extreme | — | — |  |
| Major | -1.2 | -1.4, -1.0 | <0.001 |
| Moderate | -1.8 | -2.1, -1.4 | <0.001 |
| Elixhauser comorbidity index | 0.65 | 0.60, 0.71 | <0.001 |
| Abbreviation: CI = Confidence Interval | | | |

### Inflation-adjusted Total Charge:

| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Hospital location/teaching status |  |  |  |
| Urban, teaching | — | — |  |
| Rural | -72,987 | -85,134, -60,840 | <0.001 |
| Urban, non-teaching | -14,630 | -26,525, -2,735 | 0.016 |
| Age, y | -2,164 | -2,513, -1,815 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 30,262 | 23,608, 36,915 | <0.001 |
| Race |  |  |  |
| Asian or Pacific Islander | — | — |  |
| Black | -39,697 | -67,203, -12,191 | 0.005 |
| Hispanic | 19,290 | -9,269, 47,849 | 0.2 |
| Other | -4,694 | -35,004, 25,617 | 0.8 |
| White | -34,010 | -58,975, -9,046 | 0.008 |
| Type of MI |  |  |  |
| NSTEMI | — | — |  |
| STEMI of anterior wall | 24,288 | 14,950, 33,626 | <0.001 |
| STEMI of inferior wall | -4,845 | -13,034, 3,344 | 0.2 |
| STEMI of other sites | 6,684 | -9,151, 22,518 | 0.4 |
| STEMI of unspecified site | -3,220 | -16,238, 9,798 | 0.6 |
| Insurance payer |  |  |  |
| Medicaid | — | — |  |
| Medicare | -17,868 | -31,984, -3,751 | 0.013 |
| Other | -4,906 | -22,663, 12,851 | 0.6 |
| Private | 4,173 | -11,131, 19,478 | 0.6 |
| Income quartile |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 4,846 | -4,468, 14,160 | 0.3 |
| $66,000 - $87,999 | 4,192 | -6,062, 14,446 | 0.4 |
| $88,000 or more | 17,746 | 5,601, 29,892 | 0.004 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 39,622 | 25,660, 53,584 | <0.001 |
| South | 49,181 | 39,693, 58,668 | <0.001 |
| West | 91,578 | 77,207, 105,950 | <0.001 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | -24,355 | -35,174, -13,536 | <0.001 |
| Small | -37,501 | -50,439, -24,563 | <0.001 |
| APR-DRG risk of mortality |  |  |  |
| Extreme | — | — |  |
| Major | -32,654 | -40,453, -24,855 | <0.001 |
| Moderate | -56,453 | -68,351, -44,555 | <0.001 |
| Elixhauser comorbidity index | 15,798 | 13,853, 17,742 | <0.001 |
| Abbreviation: CI = Confidence Interval | | | |