Impact of Weekend Admission on In-Hospital Outcomes in Patients with Acute Myocardial Infarction Undergoing Percutaneous Coronary Intervention

Analysis for RCOP 2025Apr-NIS-Cardio2

Eliza Aisha

## Preamble:

* **Reference Studies:**
  + [Liu et al., 2024](https://www.nature.com/articles/s41598-024-59571-w#Sec11)
* **Study Objective:** To evaluate the association between weekend admission and in-hospital outcomes among adult patients hospitalized for acute myocardial infarction who underwent percutaneous coronary intervention.
* **Data Source:** A retrospective cross-sectional study using the National Inpatient Sample (NIS), years 2018–2020.
* **Cohort Definition:** Hospitalizations were included if they met the following criteria
  + Age ≥ 18 years
  + Principal diagnosis of acute myocardial infarction
  + Underwent percutaneous coronary intervention
  + Non-missing values for admission timing
* **Exposure of Interest:** Weekend admission, categorizing admissions as Saturday–Sunday (weekend) vs. Monday–Friday (weekday).
* **Outcomes of Interest:**
  + **Primary Outcome:**
    - In-hospital mortality
  + **Secondary Outcomes:**
    - Length of stay (LOS), in days
    - Inflation-adjusted total hospital charges (in 2020 USD)
    - Mechanical ventilation use
    - Favorable discharge (discharge to home or home health; all other dispositions were classified as unfavorable)
* **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:** Elixhauser comorbidity index, thrombolytic drugs given
  + **Hospital-Level Factors:** Hospital region, bed size, and teaching status
* **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, mechanical ventilation, discharge): 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 = 931,555*1* | **Monday-Friday** N = 682,510*1* | **Saturday-Sunday** N = 249,045*1* | **p-value***2* |
| --- | --- | --- | --- | --- |
| Age, y | 65 (13) | 65 (13) | 64 (13) | <0.001 |
| Sex |  |  |  | 0.070 |
| Female | 295,325 (32%) | 217,180 (32%) | 78,145 (31%) |  |
| Male | 636,190 (68%) | 465,295 (68%) | 170,895 (69%) |  |
| Race |  |  |  | 0.4 |
| White | 680,940 (76%) | 499,385 (76%) | 181,555 (75%) |  |
| Asian or Pacific Islander | 24,615 (2.7%) | 17,745 (2.7%) | 6,870 (2.8%) |  |
| Black | 85,035 (9.4%) | 62,095 (9.4%) | 22,940 (9.5%) |  |
| Hispanic | 75,975 (8.4%) | 55,395 (8.4%) | 20,580 (8.5%) |  |
| Native American | 5,645 (0.6%) | 4,120 (0.6%) | 1,525 (0.6%) |  |
| Other | 29,680 (3.3%) | 21,785 (3.3%) | 7,895 (3.3%) |  |
| Thrombolytic drugs given | 43,115 (4.6%) | 31,300 (4.6%) | 11,815 (4.7%) | 0.2 |
| Insurance payer |  |  |  | <0.001 |
| Medicaid | 90,520 (9.7%) | 66,240 (9.7%) | 24,280 (9.8%) |  |
| Medicare | 461,095 (50%) | 341,490 (50%) | 119,605 (48%) |  |
| No charge | 4,880 (0.5%) | 3,530 (0.5%) | 1,350 (0.5%) |  |
| Other | 29,750 (3.2%) | 21,750 (3.2%) | 8,000 (3.2%) |  |
| Private | 289,865 (31%) | 209,405 (31%) | 80,460 (32%) |  |
| Self-pay | 53,900 (5.8%) | 39,020 (5.7%) | 14,880 (6.0%) |  |
| Income quartile |  |  |  | 0.7 |
| $1 - $51,999 | 267,095 (29%) | 196,015 (29%) | 71,080 (29%) |  |
| $52,000 - $65,999 | 254,820 (28%) | 186,905 (28%) | 67,915 (28%) |  |
| $66,000 - $87,999 | 221,215 (24%) | 161,940 (24%) | 59,275 (24%) |  |
| $88,000 or more | 172,265 (19%) | 125,860 (19%) | 46,405 (19%) |  |
| Hospital region |  |  |  | <0.001 |
| Midwest | 222,020 (24%) | 162,815 (24%) | 59,205 (24%) |  |
| Northeast | 149,765 (16%) | 111,280 (16%) | 38,485 (15%) |  |
| South | 382,755 (41%) | 279,415 (41%) | 103,340 (41%) |  |
| West | 177,015 (19%) | 129,000 (19%) | 48,015 (19%) |  |
| Hospital bedsize |  |  |  | 0.5 |
| Large | 490,420 (53%) | 359,695 (53%) | 130,725 (52%) |  |
| Medium | 279,625 (30%) | 204,890 (30%) | 74,735 (30%) |  |
| Small | 161,510 (17%) | 117,925 (17%) | 43,585 (18%) |  |
| Hospital location/teaching status |  |  |  | 0.6 |
| Rural | 58,985 (6.3%) | 43,405 (6.4%) | 15,580 (6.3%) |  |
| Urban, non-teaching | 176,110 (19%) | 128,800 (19%) | 47,310 (19%) |  |
| Urban, teaching | 696,460 (75%) | 510,305 (75%) | 186,155 (75%) |  |
| No. of comorbidities |  |  |  | <0.001 |
| One comorbidity | 275,265 (30%) | 200,215 (29%) | 75,050 (30%) |  |
| Two or more comorbidities | 656,290 (70%) | 482,295 (71%) | 173,995 (70%) |  |
| *1*Mean (SD); n (%) | | | | |
| *2*Design-based KruskalWallis test; Pearson's X^2: Rao & Scott adjustment | | | | |

## Univariable analysis:

| **Characteristic** | **Overall** N = 931,555*1* | **Monday-Friday** N = 682,510*1* | **Saturday-Sunday** N = 249,045*1* | **p-value***2* |
| --- | --- | --- | --- | --- |
| In-hospital mortality | 31,070 (3.3%) | 22,645 (3.3%) | 8,425 (3.4%) | 0.5 |
| Length of stay (days) | 2.00 (2.00, 4.00) | 2.00 (2.00, 4.00) | 3.00 (2.00, 4.00) | <0.001 |
| Inflation-adjusted total charge ($) | 90,547 (63,849, 137,272) | 89,989 (63,417, 136,581) | 92,098 (65,108, 139,061) | <0.001 |
| Mechanical ventilation use | 54,255 (5.8%) | 39,165 (5.7%) | 15,090 (6.1%) | 0.009 |
| Favorable discharge | 824,155 (88%) | 603,960 (88%) | 220,195 (88%) | 0.7 |
| *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** |
| --- | --- | --- | --- |
| Weekend admission |  |  |  |
| Monday-Friday | — | — |  |
| Saturday-Sunday | 1.05 | 0.99, 1.12 | 0.082 |
| Age, y | 1.03 | 1.03, 1.04 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 0.97 | 0.92, 1.03 | 0.4 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 1.32 | 1.13, 1.54 | <0.001 |
| Black | 0.92 | 0.83, 1.02 | 0.12 |
| Hispanic | 1.01 | 0.91, 1.12 | 0.8 |
| Native American | 1.43 | 1.03, 1.97 | 0.031 |
| Other | 1.32 | 1.15, 1.52 | <0.001 |
| Thrombolytic drugs given |  |  |  |
| No | — | — |  |
| Yes | 1.63 | 1.46, 1.83 | <0.001 |
| Insurance payer |  |  |  |
| Medicaid | — | — |  |
| Medicare | 0.79 | 0.71, 0.88 | <0.001 |
| Other | 1.08 | 0.94, 1.24 | 0.3 |
| Private | 0.81 | 0.72, 0.91 | <0.001 |
| Income quartile |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 0.93 | 0.86, 1.00 | 0.061 |
| $66,000 - $87,999 | 0.94 | 0.87, 1.02 | 0.14 |
| $88,000 or more | 0.96 | 0.88, 1.05 | 0.4 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 1.14 | 1.03, 1.26 | 0.011 |
| South | 1.16 | 1.07, 1.25 | <0.001 |
| West | 1.21 | 1.10, 1.33 | <0.001 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 0.95 | 0.89, 1.02 | 0.14 |
| Small | 0.85 | 0.77, 0.93 | <0.001 |
| Hospital location/teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 1.26 | 1.07, 1.47 | 0.004 |
| Urban, teaching | 1.40 | 1.21, 1.62 | <0.001 |
| Elixhauser comorbidity index | 1.40 | 1.39, 1.42 | <0.001 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

### Mechanical ventilation:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Weekend admission |  |  |  |
| Monday-Friday | — | — |  |
| Saturday-Sunday | 1.08 | 1.03, 1.13 | <0.001 |
| Age, y | 1.00 | 1.00, 1.00 | 0.6 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 1.18 | 1.12, 1.23 | <0.001 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 1.44 | 1.28, 1.61 | <0.001 |
| Black | 0.94 | 0.87, 1.02 | 0.13 |
| Hispanic | 1.11 | 1.02, 1.20 | 0.010 |
| Native American | 0.90 | 0.67, 1.21 | 0.5 |
| Other | 1.43 | 1.28, 1.60 | <0.001 |
| Thrombolytic drugs given |  |  |  |
| No | — | — |  |
| Yes | 1.66 | 1.52, 1.81 | <0.001 |
| Insurance payer |  |  |  |
| Medicaid | — | — |  |
| Medicare | 0.74 | 0.69, 0.80 | <0.001 |
| Other | 0.97 | 0.89, 1.07 | 0.6 |
| Private | 0.89 | 0.82, 0.96 | 0.002 |
| Income quartile |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 1.02 | 0.96, 1.08 | 0.5 |
| $66,000 - $87,999 | 1.05 | 0.99, 1.12 | 0.13 |
| $88,000 or more | 1.12 | 1.05, 1.21 | 0.001 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 0.94 | 0.87, 1.02 | 0.2 |
| South | 0.92 | 0.86, 0.99 | 0.020 |
| West | 0.98 | 0.91, 1.06 | 0.6 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 0.97 | 0.91, 1.03 | 0.4 |
| Small | 0.89 | 0.82, 0.96 | 0.002 |
| Hospital location/teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 1.17 | 1.04, 1.31 | 0.011 |
| Urban, teaching | 1.24 | 1.11, 1.38 | <0.001 |
| Elixhauser comorbidity index | 1.51 | 1.50, 1.53 | <0.001 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

### Favorable discharge:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Weekend admission |  |  |  |
| Monday-Friday | — | — |  |
| Saturday-Sunday | 0.96 | 0.92, 0.99 | 0.013 |
| Age, y | 0.96 | 0.96, 0.97 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 1.10 | 1.07, 1.14 | <0.001 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 0.93 | 0.84, 1.03 | 0.2 |
| Black | 0.95 | 0.89, 1.01 | 0.075 |
| Hispanic | 1.02 | 0.95, 1.08 | 0.7 |
| Native American | 1.05 | 0.84, 1.30 | 0.7 |
| Other | 0.82 | 0.74, 0.90 | <0.001 |
| Thrombolytic drugs given |  |  |  |
| No | — | — |  |
| Yes | 0.73 | 0.68, 0.79 | <0.001 |
| Insurance payer |  |  |  |
| Medicaid | — | — |  |
| Medicare | 1.16 | 1.08, 1.24 | <0.001 |
| Other | 1.18 | 1.09, 1.29 | <0.001 |
| Private | 1.44 | 1.34, 1.54 | <0.001 |
| Income quartile |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 1.05 | 1.01, 1.10 | 0.023 |
| $66,000 - $87,999 | 1.00 | 0.96, 1.05 | >0.9 |
| $88,000 or more | 0.98 | 0.93, 1.04 | 0.5 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 0.79 | 0.75, 0.84 | <0.001 |
| South | 1.00 | 0.95, 1.05 | >0.9 |
| West | 0.90 | 0.84, 0.96 | 0.001 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 0.91 | 0.86, 0.95 | <0.001 |
| Small | 0.91 | 0.86, 0.96 | <0.001 |
| Hospital location/teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 1.04 | 0.94, 1.15 | 0.5 |
| Urban, teaching | 1.13 | 1.03, 1.25 | 0.008 |
| Elixhauser comorbidity index | 0.72 | 0.72, 0.73 | <0.001 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

## Multivariable linear regression:

### Length of Stay:

| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Weekend admission |  |  |  |
| Monday-Friday | — | — |  |
| Saturday-Sunday | 0.21 | 0.16, 0.25 | <0.001 |
| Age, y | 0.02 | 0.02, 0.02 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | -0.02 | -0.06, 0.02 | 0.3 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 0.58 | 0.42, 0.74 | <0.001 |
| Black | 0.29 | 0.20, 0.37 | <0.001 |
| Hispanic | 0.37 | 0.29, 0.46 | <0.001 |
| Native American | 0.29 | -0.01, 0.59 | 0.060 |
| Other | 0.46 | 0.30, 0.61 | <0.001 |
| Thrombolytic drugs given |  |  |  |
| No | — | — |  |
| Yes | 0.28 | 0.19, 0.38 | <0.001 |
| Insurance payer |  |  |  |
| Medicaid | — | — |  |
| Medicare | -0.37 | -0.46, -0.27 | <0.001 |
| Other | -0.23 | -0.32, -0.13 | <0.001 |
| Private | -0.32 | -0.41, -0.23 | <0.001 |
| Income quartile |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | -0.06 | -0.11, 0.00 | 0.046 |
| $66,000 - $87,999 | -0.04 | -0.10, 0.02 | 0.2 |
| $88,000 or more | -0.03 | -0.10, 0.05 | 0.5 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 0.72 | 0.62, 0.82 | <0.001 |
| South | 0.14 | 0.06, 0.21 | <0.001 |
| West | -0.27 | -0.36, -0.18 | <0.001 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | -0.31 | -0.38, -0.24 | <0.001 |
| Small | -0.50 | -0.58, -0.42 | <0.001 |
| Hospital location/teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 0.29 | 0.17, 0.42 | <0.001 |
| Urban, teaching | 0.62 | 0.51, 0.74 | <0.001 |
| Elixhauser comorbidity index | 0.70 | 0.68, 0.71 | <0.001 |
| Abbreviation: CI = Confidence Interval | | | |

### Inflation-adjusted total charge:

| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Weekend admission |  |  |  |
| Monday-Friday | — | — |  |
| Saturday-Sunday | 2,159 | 1,002, 3,317 | <0.001 |
| Age, y | 108 | 41, 175 | 0.002 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 6,275 | 5,034, 7,516 | <0.001 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 19,911 | 13,721, 26,101 | <0.001 |
| Black | 673 | -2,260, 3,606 | 0.7 |
| Hispanic | 21,153 | 17,373, 24,933 | <0.001 |
| Native American | -8,038 | -15,691, -385 | 0.040 |
| Other | 21,953 | 16,094, 27,813 | <0.001 |
| Thrombolytic drugs given |  |  |  |
| No | — | — |  |
| Yes | 6,953 | 3,690, 10,217 | <0.001 |
| Insurance payer |  |  |  |
| Medicaid | — | — |  |
| Medicare | -3,680 | -6,410, -950 | 0.008 |
| Other | 949 | -2,117, 4,016 | 0.5 |
| Private | -761 | -3,260, 1,738 | 0.6 |
| Income quartile |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | -894 | -2,949, 1,162 | 0.4 |
| $66,000 - $87,999 | 171 | -2,363, 2,705 | 0.9 |
| $88,000 or more | 4,848 | 1,334, 8,362 | 0.007 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 22,760 | 17,600, 27,920 | <0.001 |
| South | 22,547 | 19,229, 25,865 | <0.001 |
| West | 45,006 | 38,963, 51,049 | <0.001 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | -2,935 | -7,131, 1,262 | 0.2 |
| Small | -6,645 | -10,853, -2,436 | 0.002 |
| Hospital location/teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 20,772 | 15,373, 26,171 | <0.001 |
| Urban, teaching | 17,786 | 12,846, 22,727 | <0.001 |
| Elixhauser comorbidity index | 14,688 | 14,017, 15,358 | <0.001 |
| Abbreviation: CI = Confidence Interval | | | |