Urban-Rural Disparities in Stroke Management and Outcomes Among Patients with Atrial Fibrillation

Analysis for RCOP group NIS-Sep-Cardio5

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## Preamble:

* **Study Objective**: Examine impact of urbanization (urban vs. rural) on stroke management and outcomes among inpatient admissions with atrial fibrillation.
* **Data Source**: Cross-sectional analysis of the National Inpatient Sample (NIS) from 2018 to 2020.
* **Patient Selection**: Included all inpatient admissions with a principal diagnosis of Stroke.
* **Outcomes**:
  + In-hospital all-cause mortality
  + Utilization of endovascular thrombectomy
  + Intracranial hemorrhage
  + Total hospital length of stay (days)
  + Total charge, inflation adjusted to 2020 ($)
* **Statistical Analysis**: Multiple logistic and linear regression to determine the independent association of household income and insurance status with in-hospital mortality, utilization of endovascular thrombectomy, intracranial hemorrhage, length of stay and total charges (inflation adjusted), respectively, adjusted for:
  + Demographics: Age, sex, race, residential income, insurance, hospital region, hospital bedsize, hospital location, and teaching status.
  + Medical History: Hypertension, diabetes mellitus, hyperlipidemia, coronary artery disease, peripheral vascular disease, heart failure, chronic kidney disease, chronic obstructive pulmonary disease, dementia, liver disease, fluid/electrolyte imbalance, obesity, prior stroke, prior cardiac surgery, presence of pacemaker/defibrillator.
  + Comorbidities: Charlson comorbidity index.
* **Software:** All analyses were performed using R Version 4.4.1 (R Foundation for Statistical Computing, Vienna, Austria)

## Baseline Table:

| **Characteristic** | **Overall** N = 345,175*1* | **Rural** N = 59,580*1* | **Urban** N = 285,595*1* | **p-value***2* |
| --- | --- | --- | --- | --- |
| Age, y | 77 (11) | 77 (11) | 77 (11) | <0.001 |
| Sex |  |  |  | 0.010 |
| Female | 179,775 (52%) | 30,410 (51%) | 149,365 (52%) |  |
| Male | 165,395 (48%) | 29,170 (49%) | 136,225 (48%) |  |
| Race |  |  |  | <0.001 |
| White | 256,185 (76%) | 50,545 (89%) | 205,640 (74%) |  |
| Asian or Pacific Islander | 10,520 (3.1%) | 335 (0.6%) | 10,185 (3.6%) |  |
| Black | 37,675 (11%) | 3,620 (6.4%) | 34,055 (12%) |  |
| Hispanic | 22,630 (6.7%) | 1,335 (2.3%) | 21,295 (7.6%) |  |
| Native American | 975 (0.3%) | 415 (0.7%) | 560 (0.2%) |  |
| Other | 8,315 (2.5%) | 720 (1.3%) | 7,595 (2.7%) |  |
| Charlson comorbidity index | 4.16 (2.18) | 4.14 (2.14) | 4.17 (2.19) | 0.4 |
| Hospital region |  |  |  | <0.001 |
| Midwest | 76,615 (22%) | 19,180 (32%) | 57,435 (20%) |  |
| Northeast | 65,060 (19%) | 6,170 (10%) | 58,890 (21%) |  |
| South | 134,515 (39%) | 27,570 (46%) | 106,945 (37%) |  |
| West | 68,985 (20%) | 6,660 (11%) | 62,325 (22%) |  |
| Hospital bedsize |  |  |  | <0.001 |
| Large | 187,610 (54%) | 37,900 (64%) | 149,710 (52%) |  |
| Medium | 98,435 (29%) | 13,490 (23%) | 84,945 (30%) |  |
| Small | 59,130 (17%) | 8,190 (14%) | 50,940 (18%) |  |
| Hospital location and teaching status |  |  |  | <0.001 |
| Rural | 23,025 (6.7%) | 21,660 (36%) | 1,365 (0.5%) |  |
| Urban, non-teaching | 56,845 (16%) | 4,465 (7.5%) | 52,380 (18%) |  |
| Urban, teaching | 265,305 (77%) | 33,455 (56%) | 231,850 (81%) |  |
| Hypertension | 305,745 (89%) | 52,005 (87%) | 253,740 (89%) | <0.001 |
| Diabetes mellitus | 125,805 (36%) | 21,970 (37%) | 103,835 (36%) | 0.3 |
| Hyperlipidemia | 213,360 (62%) | 34,660 (58%) | 178,700 (63%) | <0.001 |
| Coronary artery disease | 110,960 (32%) | 20,205 (34%) | 90,755 (32%) | <0.001 |
| Peripheral vascular disease | 40,925 (12%) | 6,495 (11%) | 34,430 (12%) | <0.001 |
| Heart failure | 115,550 (33%) | 20,035 (34%) | 95,515 (33%) | 0.7 |
| Chronic kidney disease | 82,875 (24%) | 13,315 (22%) | 69,560 (24%) | <0.001 |
| Chronic obstructive pulmonary disease | 64,135 (19%) | 12,280 (21%) | 51,855 (18%) | <0.001 |
| Dementia | 54,105 (16%) | 7,965 (13%) | 46,140 (16%) | <0.001 |
| Liver disease | 6,935 (2.0%) | 1,005 (1.7%) | 5,930 (2.1%) | 0.004 |
| Obesity | 47,855 (14%) | 8,500 (14%) | 39,355 (14%) | 0.2 |
| Prior stroke | 92,295 (27%) | 14,950 (25%) | 77,345 (27%) | <0.001 |
| Prior cardiac surgery | 38,600 (11%) | 7,220 (12%) | 31,380 (11%) | <0.001 |
| Pacemaker/ICD | 34,070 (9.9%) | 6,065 (10%) | 28,005 (9.8%) | 0.2 |
| Fluid disorders | 96,430 (28%) | 15,460 (26%) | 80,970 (28%) | <0.001 |
| *1*Mean (SD); n (%) | | | | |
| *2*Design-based KruskalWallis test; Pearson's X^2: Rao & Scott adjustment | | | | |

## Outcomes Table:

| **Characteristic** | **Overall** N = 345,175*1* | **Rural** N = 59,580*1* | **Urban** N = 285,595*1* | **p-value***2* |
| --- | --- | --- | --- | --- |
| Died during hospitalization | 22,860 (6.6%) | 4,750 (8.0%) | 18,110 (6.3%) | <0.001 |
| Length of stay (days) | 5.6 (7.0) | 5.4 (6.8) | 5.7 (7.0) | <0.001 |
| Inflation-adjusted total charge ($) | 82,525 (108,430) | 60,183 (74,360) | 87,201 (113,728) | <0.001 |
| Intracranial Hemorrhage | 31,230 (9.0%) | 5,100 (8.6%) | 26,130 (9.1%) | 0.063 |
| Utilization of mechanical thrombectomy |  |  |  |  |
| MT | 345,175 (100%) | 59,580 (100%) | 285,595 (100%) |  |
| *1*n (%); Mean (SD) | | | | |
| *2*Pearson's X^2: Rao & Scott adjustment; Design-based KruskalWallis test | | | | |

## Multivariable Logistic Regression:

### All-Cause Mortality:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Urbanization |  |  |  |
| Rural | — | — |  |
| Urban | 0.78 | 0.71, 0.87 | <0.001 |
| Residential income |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 0.88 | 0.81, 0.97 | 0.007 |
| $66,000 - $87,999 | 0.84 | 0.76, 0.93 | <0.001 |
| $88,000 or more | 0.83 | 0.74, 0.92 | <0.001 |
| Expected primary payer |  |  |  |
| Private | — | — |  |
| Medicaid | 0.94 | 0.78, 1.13 | 0.5 |
| Medicare | 0.70 | 0.63, 0.79 | <0.001 |
| Other | 1.70 | 1.37, 2.10 | <0.001 |
| Age, y | 1.04 | 1.03, 1.04 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 0.98 | 0.91, 1.05 | 0.5 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 1.16 | 0.97, 1.38 | 0.10 |
| Black | 0.82 | 0.72, 0.93 | 0.002 |
| Hispanic | 1.00 | 0.87, 1.15 | >0.9 |
| Native American | 0.55 | 0.25, 1.20 | 0.13 |
| Other | 1.12 | 0.92, 1.35 | 0.3 |
| Charlson comorbidity index | 1.17 | 1.15, 1.19 | <0.001 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 1.17 | 1.05, 1.31 | 0.004 |
| South | 0.90 | 0.82, 1.00 | 0.042 |
| West | 1.16 | 1.03, 1.29 | 0.011 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 0.85 | 0.79, 0.93 | <0.001 |
| Small | 0.72 | 0.65, 0.80 | <0.001 |
| Hospital location and teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 0.87 | 0.73, 1.04 | 0.13 |
| Urban, teaching | 1.28 | 1.10, 1.49 | 0.001 |
| Hypertension |  |  |  |
| No | — | — |  |
| Yes | 0.70 | 0.63, 0.76 | <0.001 |
| Diabetes mellitus |  |  |  |
| No | — | — |  |
| Yes | 0.86 | 0.79, 0.92 | <0.001 |
| Hyperlipidemia |  |  |  |
| No | — | — |  |
| Yes | 0.61 | 0.57, 0.65 | <0.001 |
| Coronary artery disease |  |  |  |
| No | — | — |  |
| Yes | 0.96 | 0.89, 1.04 | 0.3 |
| Peripheral vascular disease |  |  |  |
| No | — | — |  |
| Yes | 0.91 | 0.82, 1.00 | 0.057 |
| Heart failure |  |  |  |
| No | — | — |  |
| Yes | 1.17 | 1.09, 1.26 | <0.001 |
| Chronic kidney disease |  |  |  |
| No | — | — |  |
| Yes | 0.73 | 0.67, 0.79 | <0.001 |
| Chronic obstructive pulmonary disease |  |  |  |
| No | — | — |  |
| Yes | 0.92 | 0.85, 1.00 | 0.056 |
| Dementia |  |  |  |
| No | — | — |  |
| Yes | 0.79 | 0.72, 0.86 | <0.001 |
| Liver disease |  |  |  |
| No | — | — |  |
| Yes | 1.58 | 1.32, 1.88 | <0.001 |
| Obesity |  |  |  |
| No | — | — |  |
| Yes | 0.74 | 0.66, 0.82 | <0.001 |
| Prior stroke |  |  |  |
| No | — | — |  |
| Yes | 0.86 | 0.80, 0.93 | <0.001 |
| Prior cardiac surgery |  |  |  |
| No | — | — |  |
| Yes | 0.89 | 0.79, 1.00 | 0.048 |
| Pacemaker/ICD |  |  |  |
| No | — | — |  |
| Yes | 0.79 | 0.70, 0.88 | <0.001 |
| Fluid\_disorders |  |  |  |
| No | — | — |  |
| Yes | 1.87 | 1.75, 2.00 | <0.001 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

### Intracranial Hemorrhage:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Urbanization |  |  |  |
| Rural | — | — |  |
| Urban | 0.79 | 0.72, 0.86 | <0.001 |
| Residential income |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 0.97 | 0.90, 1.05 | 0.4 |
| $66,000 - $87,999 | 1.01 | 0.92, 1.09 | 0.9 |
| $88,000 or more | 1.01 | 0.92, 1.10 | 0.9 |
| Expected primary payer |  |  |  |
| Private | — | — |  |
| Medicaid | 0.99 | 0.87, 1.14 | >0.9 |
| Medicare | 1.01 | 0.92, 1.10 | 0.8 |
| Other | 1.00 | 0.81, 1.23 | >0.9 |
| Age, y | 1.00 | 1.00, 1.00 | >0.9 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 1.10 | 1.04, 1.17 | <0.001 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 1.79 | 1.56, 2.04 | <0.001 |
| Black | 1.00 | 0.91, 1.09 | >0.9 |
| Hispanic | 1.39 | 1.25, 1.55 | <0.001 |
| Native American | 0.63 | 0.33, 1.23 | 0.2 |
| Other | 1.40 | 1.20, 1.63 | <0.001 |
| Charlson comorbidity index | 1.11 | 1.10, 1.13 | <0.001 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 1.19 | 1.08, 1.32 | <0.001 |
| South | 0.98 | 0.90, 1.07 | 0.6 |
| West | 1.03 | 0.93, 1.14 | 0.6 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 0.69 | 0.65, 0.75 | <0.001 |
| Small | 0.51 | 0.46, 0.56 | <0.001 |
| Hospital location and teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 1.94 | 1.56, 2.41 | <0.001 |
| Urban, teaching | 3.60 | 2.95, 4.40 | <0.001 |
| Hypertension |  |  |  |
| No | — | — |  |
| Yes | 0.96 | 0.88, 1.04 | 0.3 |
| Diabetes mellitus |  |  |  |
| No | — | — |  |
| Yes | 0.92 | 0.87, 0.99 | 0.017 |
| Hyperlipidemia |  |  |  |
| No | — | — |  |
| Yes | 0.89 | 0.84, 0.95 | <0.001 |
| Coronary artery disease |  |  |  |
| No | — | — |  |
| Yes | 0.88 | 0.82, 0.94 | <0.001 |
| Peripheral vascular disease |  |  |  |
| No | — | — |  |
| Yes | 0.85 | 0.77, 0.93 | <0.001 |
| Heart failure |  |  |  |
| No | — | — |  |
| Yes | 1.01 | 0.95, 1.08 | 0.7 |
| Chronic kidney disease |  |  |  |
| No | — | — |  |
| Yes | 0.63 | 0.58, 0.68 | <0.001 |
| Chronic obstructive pulmonary disease |  |  |  |
| No | — | — |  |
| Yes | 0.72 | 0.66, 0.77 | <0.001 |
| Dementia |  |  |  |
| No | — | — |  |
| Yes | 0.72 | 0.66, 0.78 | <0.001 |
| Liver disease |  |  |  |
| No | — | — |  |
| Yes | 0.82 | 0.68, 0.99 | 0.034 |
| Obesity |  |  |  |
| No | — | — |  |
| Yes | 0.97 | 0.90, 1.06 | 0.5 |
| Prior stroke |  |  |  |
| No | — | — |  |
| Yes | 0.79 | 0.74, 0.85 | <0.001 |
| Prior cardiac surgery |  |  |  |
| No | — | — |  |
| Yes | 0.88 | 0.79, 0.98 | 0.018 |
| Pacemaker/ICD |  |  |  |
| No | — | — |  |
| Yes | 0.66 | 0.59, 0.74 | <0.001 |
| Fluid\_disorders |  |  |  |
| No | — | — |  |
| Yes | 1.57 | 1.48, 1.66 | <0.001 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

### Utilization of Mechanical Thrombectomy:

| **Characteristic** | **OR** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Urbanization |  |  |  |
| Rural | — | — |  |
| Urban | 1.00 | 0.95, 1.06 | >0.9 |
| Residential income |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 1.00 | 0.97, 1.04 | >0.9 |
| $66,000 - $87,999 | 1.00 | 0.96, 1.04 | >0.9 |
| $88,000 or more | 1.00 | 0.95, 1.06 | >0.9 |
| Expected primary payer |  |  |  |
| Private | — | — |  |
| Medicaid | 1.00 | 0.95, 1.05 | >0.9 |
| Medicare | 1.00 | 0.96, 1.04 | >0.9 |
| Other | 1.00 | 0.93, 1.08 | >0.9 |
| Age, y | 1.00 | 1.00, 1.00 | >0.9 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 1.00 | 0.98, 1.02 | >0.9 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 1.00 | 0.92, 1.09 | >0.9 |
| Black | 1.00 | 0.95, 1.05 | >0.9 |
| Hispanic | 1.00 | 0.94, 1.07 | >0.9 |
| Native American | 1.00 | 0.85, 1.18 | >0.9 |
| Other | 1.00 | 0.92, 1.08 | >0.9 |
| Charlson comorbidity index | 1.00 | 0.99, 1.01 | >0.9 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 1.00 | 0.93, 1.07 | >0.9 |
| South | 1.00 | 0.95, 1.06 | >0.9 |
| West | 1.00 | 0.94, 1.06 | >0.9 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | 1.00 | 0.95, 1.05 | >0.9 |
| Small | 1.00 | 0.95, 1.05 | >0.9 |
| Hospital location and teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 1.00 | 0.92, 1.09 | >0.9 |
| Urban, teaching | 1.00 | 0.92, 1.08 | >0.9 |
| Hypertension |  |  |  |
| No | — | — |  |
| Yes | 1.00 | 0.97, 1.03 | >0.9 |
| Diabetes mellitus |  |  |  |
| No | — | — |  |
| Yes | 1.00 | 0.98, 1.02 | >0.9 |
| Hyperlipidemia |  |  |  |
| No | — | — |  |
| Yes | 1.00 | 0.98, 1.02 | >0.9 |
| Coronary artery disease |  |  |  |
| No | — | — |  |
| Yes | 1.00 | 0.98, 1.02 | >0.9 |
| Peripheral vascular disease |  |  |  |
| No | — | — |  |
| Yes | 1.00 | 0.97, 1.03 | >0.9 |
| Heart failure |  |  |  |
| No | — | — |  |
| Yes | 1.00 | 0.98, 1.02 | >0.9 |
| Chronic kidney disease |  |  |  |
| No | — | — |  |
| Yes | 1.00 | 0.97, 1.03 | >0.9 |
| Chronic obstructive pulmonary disease |  |  |  |
| No | — | — |  |
| Yes | 1.00 | 0.98, 1.02 | >0.9 |
| Dementia |  |  |  |
| No | — | — |  |
| Yes | 1.00 | 0.98, 1.02 | >0.9 |
| Liver disease |  |  |  |
| No | — | — |  |
| Yes | 1.00 | 0.95, 1.06 | >0.9 |
| Obesity |  |  |  |
| No | — | — |  |
| Yes | 1.00 | 0.97, 1.03 | >0.9 |
| Prior stroke |  |  |  |
| No | — | — |  |
| Yes | 1.00 | 0.98, 1.02 | >0.9 |
| Prior cardiac surgery |  |  |  |
| No | — | — |  |
| Yes | 1.00 | 0.97, 1.03 | >0.9 |
| Pacemaker/ICD |  |  |  |
| No | — | — |  |
| Yes | 1.00 | 0.97, 1.03 | >0.9 |
| Fluid\_disorders |  |  |  |
| No | — | — |  |
| Yes | 1.00 | 0.98, 1.02 | >0.9 |
| Abbreviations: CI = Confidence Interval, OR = Odds Ratio | | | |

## Multivariable Linear Regression:

### Length of Stay:

| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Urbanization |  |  |  |
| Rural | — | — |  |
| Urban | -0.13 | -0.30, 0.04 | 0.14 |
| Residential income |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | -0.27 | -0.42, -0.12 | <0.001 |
| $66,000 - $87,999 | -0.22 | -0.38, -0.05 | 0.010 |
| $88,000 or more | -0.32 | -0.49, -0.14 | <0.001 |
| Expected primary payer |  |  |  |
| Private | — | — |  |
| Medicaid | 2.4 | 1.8, 3.0 | <0.001 |
| Medicare | -0.09 | -0.27, 0.10 | 0.4 |
| Other | -0.12 | -0.57, 0.34 | 0.6 |
| Age, y | -0.02 | -0.02, -0.01 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 0.15 | 0.04, 0.26 | 0.007 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 0.88 | 0.52, 1.2 | <0.001 |
| Black | 1.2 | 0.94, 1.4 | <0.001 |
| Hispanic | 0.90 | 0.64, 1.2 | <0.001 |
| Native American | 0.33 | -0.59, 1.2 | 0.5 |
| Other | 1.1 | 0.58, 1.6 | <0.001 |
| Charlson comorbidity index | 0.39 | 0.36, 0.43 | <0.001 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 0.61 | 0.44, 0.79 | <0.001 |
| South | 0.32 | 0.17, 0.47 | <0.001 |
| West | -0.07 | -0.25, 0.11 | 0.4 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | -0.59 | -0.73, -0.44 | <0.001 |
| Small | -1.2 | -1.3, -1.1 | <0.001 |
| Hospital location and teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 0.42 | 0.17, 0.66 | <0.001 |
| Urban, teaching | 1.3 | 1.1, 1.5 | <0.001 |
| Hypertension |  |  |  |
| No | — | — |  |
| Yes | -0.33 | -0.54, -0.13 | 0.001 |
| Diabetes mellitus |  |  |  |
| No | — | — |  |
| Yes | -0.32 | -0.44, -0.20 | <0.001 |
| Hyperlipidemia |  |  |  |
| No | — | — |  |
| Yes | -0.41 | -0.52, -0.29 | <0.001 |
| Coronary artery disease |  |  |  |
| No | — | — |  |
| Yes | -0.16 | -0.28, -0.05 | 0.005 |
| Peripheral vascular disease |  |  |  |
| No | — | — |  |
| Yes | -0.15 | -0.31, 0.01 | 0.068 |
| Heart failure |  |  |  |
| No | — | — |  |
| Yes | 0.50 | 0.36, 0.63 | <0.001 |
| Chronic kidney disease |  |  |  |
| No | — | — |  |
| Yes | -0.85 | -1.0, -0.69 | <0.001 |
| Chronic obstructive pulmonary disease |  |  |  |
| No | — | — |  |
| Yes | -0.39 | -0.52, -0.26 | <0.001 |
| Dementia |  |  |  |
| No | — | — |  |
| Yes | 0.26 | 0.12, 0.40 | <0.001 |
| Liver disease |  |  |  |
| No | — | — |  |
| Yes | 0.45 | -0.06, 0.95 | 0.081 |
| Obesity |  |  |  |
| No | — | — |  |
| Yes | 0.07 | -0.08, 0.22 | 0.4 |
| Prior stroke |  |  |  |
| No | — | — |  |
| Yes | -0.12 | -0.23, 0.00 | 0.048 |
| Prior cardiac surgery |  |  |  |
| No | — | — |  |
| Yes | -0.39 | -0.53, -0.26 | <0.001 |
| Pacemaker/ICD |  |  |  |
| No | — | — |  |
| Yes | -0.71 | -0.84, -0.59 | <0.001 |
| Fluid\_disorders |  |  |  |
| No | — | — |  |
| Yes | 3.2 | 3.0, 3.3 | <0.001 |
| Abbreviation: CI = Confidence Interval | | | |

### Inflation Adjusted Total Charge:

| **Characteristic** | **Beta** | **95% CI** | **p-value** |
| --- | --- | --- | --- |
| Urbanization |  |  |  |
| Rural | — | — |  |
| Urban | 8,924 | 5,942, 11,906 | <0.001 |
| Residential income |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | -3,305 | -5,854, -755 | 0.011 |
| $66,000 - $87,999 | -3,174 | -6,202, -146 | 0.040 |
| $88,000 or more | 826 | -3,240, 4,892 | 0.7 |
| Expected primary payer |  |  |  |
| Private | — | — |  |
| Medicaid | 23,533 | 15,288, 31,778 | <0.001 |
| Medicare | 1,435 | -1,596, 4,466 | 0.4 |
| Other | -5,825 | -12,227, 577 | 0.075 |
| Age, y | -580 | -685, -474 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 1,919 | 300, 3,538 | 0.020 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 22,955 | 13,403, 32,506 | <0.001 |
| Black | 7,649 | 4,016, 11,281 | <0.001 |
| Hispanic | 33,829 | 27,750, 39,909 | <0.001 |
| Native American | -18,215 | -27,027, -9,403 | <0.001 |
| Other | 33,323 | 24,480, 42,165 | <0.001 |
| Charlson comorbidity index | 7,458 | 6,815, 8,102 | <0.001 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 19,122 | 14,559, 23,685 | <0.001 |
| South | 16,573 | 13,411, 19,735 | <0.001 |
| West | 39,117 | 34,198, 44,036 | <0.001 |
| Hospital bedsize |  |  |  |
| Large | — | — |  |
| Medium | -12,645 | -16,377, -8,913 | <0.001 |
| Small | -24,306 | -28,285, -20,327 | <0.001 |
| Hospital location and teaching status |  |  |  |
| Rural | — | — |  |
| Urban, non-teaching | 22,552 | 17,827, 27,277 | <0.001 |
| Urban, teaching | 36,538 | 33,247, 39,829 | <0.001 |
| Hypertension |  |  |  |
| No | — | — |  |
| Yes | -8,134 | -11,352, -4,917 | <0.001 |
| Diabetes mellitus |  |  |  |
| No | — | — |  |
| Yes | -8,771 | -10,854, -6,689 | <0.001 |
| Hyperlipidemia |  |  |  |
| No | — | — |  |
| Yes | -3,381 | -5,231, -1,531 | <0.001 |
| Coronary artery disease |  |  |  |
| No | — | — |  |
| Yes | -1,517 | -3,436, 403 | 0.12 |
| Peripheral vascular disease |  |  |  |
| No | — | — |  |
| Yes | -4,073 | -6,866, -1,280 | 0.004 |
| Heart failure |  |  |  |
| No | — | — |  |
| Yes | 2,773 | 731, 4,815 | 0.008 |
| Chronic kidney disease |  |  |  |
| No | — | — |  |
| Yes | -22,581 | -25,067, -20,095 | <0.001 |
| Chronic obstructive pulmonary disease |  |  |  |
| No | — | — |  |
| Yes | -8,013 | -10,068, -5,958 | <0.001 |
| Dementia |  |  |  |
| No | — | — |  |
| Yes | -14,456 | -16,423, -12,489 | <0.001 |
| Liver disease |  |  |  |
| No | — | — |  |
| Yes | 12,065 | 2,415, 21,715 | 0.014 |
| Obesity |  |  |  |
| No | — | — |  |
| Yes | 3,501 | 1,014, 5,989 | 0.006 |
| Prior stroke |  |  |  |
| No | — | — |  |
| Yes | -5,441 | -7,349, -3,534 | <0.001 |
| Prior cardiac surgery |  |  |  |
| No | — | — |  |
| Yes | -5,400 | -7,869, -2,930 | <0.001 |
| Pacemaker/ICD |  |  |  |
| No | — | — |  |
| Yes | -9,699 | -11,818, -7,579 | <0.001 |
| Fluid\_disorders |  |  |  |
| No | — | — |  |
| Yes | 43,372 | 40,741, 46,003 | <0.001 |
| Abbreviation: CI = Confidence Interval | | | |