Racial and Gender Disparities in Mechanical Thrombectomy Utilization in Stroke Patients

Analysis for RCOP NIS group

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## Preamble:

* **Reference Papers:**
  + [Rinaldo et al.2019](https://www.ahajournals.org/doi/full/10.1161/STROKEAHA.118.024651?rfr_dat=cr_pub++0pubmed&url_ver=Z39.88-2003&rfr_id=ori%3Arid%3Acrossref.org)
  + [Saber et al.2022](https://www.ahajournals.org/doi/10.1161/SVIN.121.000164)
* **Study Objective**: Examine racial and gender disparities in utilization of mechanical thrombectomy among inpatient admissions with a principal diagnosis of ischemic stroke.
* **Data Source**: Cross-sectional analysis of the National Inpatient Sample (NIS) from 2018 to 2020.
* **Population**: Included all inpatient admissions with a principal diagnosis of Stroke.There were a total of 1,601,840 hospital admissions between 2018-2020 with a principal diagnosis of Stroke. Of these, 1,560,970 had data available for race and gender.
* **ICD-10 codes used**: Ischemic Stroke (ICD-10-CM: I63), Mechanical Thrombectomy (ICD-10-PCS: 03CG3ZZ), IV-tPA (ICD-10-CM: Z9282 OR ICD-10-PCS: 3E03317)
* **Primary Outcomes**:
  + Assessing characterstics in the thrombectomy vs no thrombectomy groups
  + Assessing racial disparities in patients utilizing mechanical thrombectomy
  + Assessing gender disparities in patients utilizing mechanical thrombectomy
* **Statistical Analysis**: Descriptive statistics for variables of interest are present as frequency and percentage of total admissions. Comparative statistics between patient groups was performed. Multiple logistic regression was performed to identify variables independently associated with utilization of mechanical thrombectomy.
* **Software:** All analyses were performed using R Version 4.4.1 (R Foundation for Statistical Computing, Vienna, Austria)

## Descriptive analysis

### Baseline Characterstics:

| **Characteristic** | **Overall** N = 1,560,970*1* | **No Thrombectomy** N = 1,512,065*1* | **Thrombectomy** N = 48,905*1* | **p-value***2* |
| --- | --- | --- | --- | --- |
| Age, y | 71 (61 – 81) | 71 (61 – 81) | 71 (60 – 81) | <0.001 |
| Sex |  |  |  | <0.001 |
| Female | 769,740 (49) | 744,675 (49) | 25,065 (51) |  |
| Male | 791,230 (51) | 767,390 (51) | 23,840 (49) |  |
| Race |  |  |  | <0.001 |
| White | 1,057,235 (68) | 1,022,880 (68) | 34,355 (70) |  |
| Asian or Pacific Islander | 48,765 (3.1) | 47,190 (3.1) | 1,575 (3.2) |  |
| Black | 274,255 (18) | 266,820 (18) | 7,435 (15) |  |
| Hispanic | 132,025 (8.5) | 128,225 (8.5) | 3,800 (7.8) |  |
| Native American | 7,590 (0.5) | 7,445 (0.5) | 145 (0.3) |  |
| Other | 41,100 (2.6) | 39,505 (2.6) | 1,595 (3.3) |  |
| Residential income |  |  |  | <0.001 |
| $1 - $51,999 | 471,545 (31) | 457,815 (31) | 13,730 (29) |  |
| $52,000 - $65,999 | 409,120 (27) | 396,545 (27) | 12,575 (26) |  |
| $66,000 - $87,999 | 363,690 (24) | 351,895 (24) | 11,795 (24) |  |
| $88,000 or more | 291,765 (19) | 281,720 (19) | 10,045 (21) |  |
| Expected primary payer |  |  |  | <0.001 |
| Private | 367,905 (24) | 355,315 (24) | 12,590 (26) |  |
| Medicaid | 149,210 (9.6) | 144,475 (9.6) | 4,735 (9.7) |  |
| Medicare | 1,004,965 (64) | 974,595 (65) | 30,370 (62) |  |
| Other | 36,860 (2.4) | 35,725 (2.4) | 1,135 (2.3) |  |
| Hospital region |  |  |  | <0.001 |
| East North Central | 234,100 (15) | 227,390 (15) | 6,710 (14) |  |
| East South Central | 128,465 (8.2) | 124,055 (8.2) | 4,410 (9.0) |  |
| Middle Atlantic | 203,165 (13) | 197,490 (13) | 5,675 (12) |  |
| Mountain | 87,630 (5.6) | 84,155 (5.6) | 3,475 (7.1) |  |
| New England | 67,165 (4.3) | 65,560 (4.3) | 1,605 (3.3) |  |
| Pacific | 205,815 (13) | 198,645 (13) | 7,170 (15) |  |
| South Atlantic | 354,295 (23) | 342,600 (23) | 11,695 (24) |  |
| West North Central | 94,680 (6.1) | 91,500 (6.1) | 3,180 (6.5) |  |
| West South Central | 185,655 (12) | 180,670 (12) | 4,985 (10) |  |
| Hospital bedsize |  |  |  | <0.001 |
| Large | 824,595 (53) | 788,650 (52) | 35,945 (73) |  |
| Medium | 451,635 (29) | 441,700 (29) | 9,935 (20) |  |
| Small | 284,740 (18) | 281,715 (19) | 3,025 (6.2) |  |
| Hospital location and teaching status |  |  |  | <0.001 |
| Rural | 109,785 (7.0) | 109,655 (7.3) | 130 (0.3) |  |
| Urban, non-teaching | 277,730 (18) | 274,090 (18) | 3,640 (7.4) |  |
| Urban, teaching | 1,173,455 (75) | 1,128,320 (75) | 45,135 (92) |  |
| IV tiissue-type plasminogen activator | 196,560 (13) | 179,715 (12) | 16,845 (34) | <0.001 |
| Hypertension | 1,326,705 (85) | 1,287,740 (85) | 38,965 (80) | <0.001 |
| Diabetes mellitus | 617,370 (40) | 602,940 (40) | 14,430 (30) | <0.001 |
| Atrial fibrillation | 333,345 (21) | 314,695 (21) | 18,650 (38) | <0.001 |
| Coronary artery disease | 366,570 (23) | 355,320 (23) | 11,250 (23) | 0.25 |
| Chronic kidney disease | 293,465 (19) | 286,450 (19) | 7,015 (14) | <0.001 |
| Heart failure | 298,465 (19) | 285,545 (19) | 12,920 (26) | <0.001 |
| Charlson comorbidity index | 3.00 (2.00 – 5.00) | 3.00 (2.00 – 5.00) | 4.00 (3.00 – 5.00) | <0.001 |
| *1*Median (Q1 – Q3); n (%) | | | | |
| *2*Design-based KruskalWallis test; Pearson's X^2: Rao & Scott adjustment | | | | |

### Comparison of male vs female patients undergoing MT:

| **Characteristic** | **Female** N = 769,740*1* | **Male** N = 791,230*1* |
| --- | --- | --- |
| Age, y | 74 (63 – 84) | 68 (59 – 78) |
| Race |  |  |
| White | 522,375 (68) | 534,860 (68) |
| Asian or Pacific Islander | 23,255 (3.0) | 25,510 (3.2) |
| Black | 139,865 (18) | 134,390 (17) |
| Hispanic | 61,535 (8.0) | 70,490 (8.9) |
| Native American | 3,680 (0.5) | 3,910 (0.5) |
| Other | 19,030 (2.5) | 22,070 (2.8) |
| Residential income |  |  |
| $1 - $51,999 | 234,200 (31) | 237,345 (31) |
| $52,000 - $65,999 | 202,080 (27) | 207,040 (27) |
| $66,000 - $87,999 | 179,765 (24) | 183,925 (24) |
| $88,000 or more | 143,165 (19) | 148,600 (19) |
| Expected primary payer |  |  |
| Private | 150,960 (20) | 216,945 (27) |
| Medicaid | 66,825 (8.7) | 82,385 (10) |
| Medicare | 541,485 (70) | 463,480 (59) |
| Other | 9,785 (1.3) | 27,075 (3.4) |
| Hospital region |  |  |
| East North Central | 117,135 (15) | 116,965 (15) |
| East South Central | 64,035 (8.3) | 64,430 (8.1) |
| Middle Atlantic | 100,485 (13) | 102,680 (13) |
| Mountain | 41,435 (5.4) | 46,195 (5.8) |
| New England | 33,135 (4.3) | 34,030 (4.3) |
| Pacific | 98,695 (13) | 107,120 (14) |
| South Atlantic | 176,150 (23) | 178,145 (23) |
| West North Central | 47,225 (6.1) | 47,455 (6.0) |
| West South Central | 91,445 (12) | 94,210 (12) |
| Hospital bedsize |  |  |
| Large | 402,790 (52) | 421,805 (53) |
| Medium | 223,390 (29) | 228,245 (29) |
| Small | 143,560 (19) | 141,180 (18) |
| Hospital location and teaching status |  |  |
| Rural | 57,195 (7.4) | 52,590 (6.6) |
| Urban, non-teaching | 138,285 (18) | 139,445 (18) |
| Urban, teaching | 574,260 (75) | 599,195 (76) |
| IV tiissue-type plasminogen activator | 95,300 (12) | 101,260 (13) |
| Hypertension | 654,825 (85) | 671,880 (85) |
| Diabetes mellitus | 293,865 (38) | 323,505 (41) |
| Atrial fibrillation | 173,875 (23) | 159,470 (20) |
| Coronary artery disease | 149,660 (19) | 216,910 (27) |
| Chronic kidney disease | 137,050 (18) | 156,415 (20) |
| Heart failure | 143,230 (19) | 155,235 (20) |
| Charlson comorbidity index | 3.00 (2.00 – 5.00) | 3.00 (2.00 – 5.00) |
| *1*Median (Q1 – Q3); n (%) | | |

### Comparison of different racial groups undergoing MT:

| **Characteristic** | **White** N = 1,057,235*1* | **Asian or Pacific Islander** N = 48,765*1* | **Black** N = 274,255*1* | **Hispanic** N = 132,025*1* | **Native American** N = 7,590*1* | **Other** N = 41,100*1* |
| --- | --- | --- | --- | --- | --- | --- |
| Age, y | 73 (63 – 83) | 71 (61 – 81) | 64 (56 – 74) | 67 (57 – 78) | 65 (57 – 75) | 69 (58 – 79) |
| Sex |  |  |  |  |  |  |
| Female | 522,375 (49) | 23,255 (48) | 139,865 (51) | 61,535 (47) | 3,680 (48) | 19,030 (46) |
| Male | 534,860 (51) | 25,510 (52) | 134,390 (49) | 70,490 (53) | 3,910 (52) | 22,070 (54) |
| Residential income |  |  |  |  |  |  |
| $1 - $51,999 | 261,305 (25) | 5,885 (12) | 140,660 (52) | 49,200 (38) | 3,340 (47) | 11,155 (28) |
| $52,000 - $65,999 | 297,305 (29) | 8,725 (18) | 58,735 (22) | 33,745 (26) | 1,800 (25) | 8,810 (22) |
| $66,000 - $87,999 | 266,225 (26) | 13,165 (27) | 43,895 (16) | 29,095 (22) | 1,305 (18) | 10,005 (25) |
| $88,000 or more | 216,255 (21) | 20,380 (42) | 26,825 (9.9) | 17,280 (13) | 715 (10.0) | 10,310 (26) |
| Expected primary payer |  |  |  |  |  |  |
| Private | 229,775 (22) | 13,170 (27) | 75,315 (28) | 36,205 (27) | 1,715 (23) | 11,725 (29) |
| Medicaid | 64,550 (6.1) | 7,360 (15) | 45,910 (17) | 23,740 (18) | 1,325 (18) | 6,325 (15) |
| Medicare | 736,880 (70) | 27,325 (56) | 145,365 (53) | 69,235 (53) | 4,115 (54) | 22,045 (54) |
| Other | 24,750 (2.3) | 850 (1.7) | 7,220 (2.6) | 2,695 (2.0) | 405 (5.4) | 940 (2.3) |
| Hospital region |  |  |  |  |  |  |
| East North Central | 180,120 (17) | 3,215 (6.6) | 40,190 (15) | 6,815 (5.2) | 485 (6.4) | 3,275 (8.0) |
| East South Central | 96,710 (9.1) | 580 (1.2) | 28,505 (10) | 1,620 (1.2) | 120 (1.6) | 930 (2.3) |
| Middle Atlantic | 133,785 (13) | 6,580 (13) | 36,075 (13) | 15,325 (12) | 350 (4.6) | 11,050 (27) |
| Mountain | 65,620 (6.2) | 2,340 (4.8) | 5,585 (2.0) | 10,800 (8.2) | 1,625 (21) | 1,660 (4.0) |
| New England | 54,825 (5.2) | 1,255 (2.6) | 5,640 (2.1) | 4,195 (3.2) | 140 (1.8) | 1,110 (2.7) |
| Pacific | 115,160 (11) | 26,155 (54) | 17,055 (6.2) | 38,475 (29) | 1,455 (19) | 7,515 (18) |
| South Atlantic | 220,870 (21) | 4,635 (9.5) | 98,340 (36) | 22,330 (17) | 1,100 (14) | 7,020 (17) |
| West North Central | 81,185 (7.7) | 1,350 (2.8) | 9,085 (3.3) | 1,380 (1.0) | 930 (12) | 750 (1.8) |
| West South Central | 108,960 (10) | 2,655 (5.4) | 33,780 (12) | 31,085 (24) | 1,385 (18) | 7,790 (19) |
| Hospital bedsize |  |  |  |  |  |  |
| Large | 558,930 (53) | 26,735 (55) | 146,590 (53) | 66,800 (51) | 4,735 (62) | 20,805 (51) |
| Medium | 301,645 (29) | 13,055 (27) | 79,130 (29) | 43,160 (33) | 1,460 (19) | 13,185 (32) |
| Small | 196,660 (19) | 8,975 (18) | 48,535 (18) | 22,065 (17) | 1,395 (18) | 7,110 (17) |
| Hospital location and teaching status |  |  |  |  |  |  |
| Rural | 91,055 (8.6) | 1,145 (2.3) | 12,930 (4.7) | 2,435 (1.8) | 1,400 (18) | 820 (2.0) |
| Urban, non-teaching | 199,130 (19) | 9,665 (20) | 36,960 (13) | 24,765 (19) | 880 (12) | 6,330 (15) |
| Urban, teaching | 767,050 (73) | 37,955 (78) | 224,365 (82) | 104,825 (79) | 5,310 (70) | 33,950 (83) |
| IV tiissue-type plasminogen activator | 137,545 (13) | 5,885 (12) | 29,720 (11) | 17,035 (13) | 860 (11) | 5,515 (13) |
| Hypertension | 884,705 (84) | 42,210 (87) | 245,725 (90) | 113,015 (86) | 6,325 (83) | 34,725 (84) |
| Diabetes mellitus | 368,970 (35) | 23,510 (48) | 133,045 (49) | 69,810 (53) | 3,690 (49) | 18,345 (45) |
| Atrial fibrillation | 253,465 (24) | 10,455 (21) | 37,540 (14) | 22,620 (17) | 965 (13) | 8,300 (20) |
| Coronary artery disease | 269,890 (26) | 9,015 (18) | 51,500 (19) | 26,255 (20) | 1,490 (20) | 8,420 (20) |
| Chronic kidney disease | 184,685 (17) | 9,945 (20) | 66,920 (24) | 23,855 (18) | 1,360 (18) | 6,700 (16) |
| Heart failure | 196,265 (19) | 7,400 (15) | 63,355 (23) | 22,705 (17) | 1,535 (20) | 7,205 (18) |
| Charlson comorbidity index | 3.00 (2.00 – 5.00) | 4.00 (2.00 – 5.00) | 4.00 (3.00 – 5.00) | 4.00 (2.00 – 5.00) | 4.00 (3.00 – 5.00) | 3.00 (2.00 – 5.00) |
| *1*Median (Q1 – Q3); n (%) | | | | | | |

## Multivariable Logistic Regression:

### Utilization of Mechanical Thrombectomy:

| **Characteristic** | **OR** **(95% CI)***1* | **p-value** |
| --- | --- | --- |
| Age, y | 1.00 (1.00 to 1.00) | 0.061 |
| Sex |  |  |
| Female | — |  |
| Male | 0.89 (0.85 to 0.92) | <0.001 |
| Race |  |  |
| White | — |  |
| Asian or Pacific Islander | 0.89 (0.78 to 1.01) | 0.068 |
| Black | 0.74 (0.69 to 0.80) | <0.001 |
| Hispanic | 0.81 (0.72 to 0.91) | <0.001 |
| Native American | 0.61 (0.41 to 0.92) | 0.017 |
| Other | 1.13 (0.99 to 1.30) | 0.078 |
| Residential income |  |  |
| $1 - $51,999 | — |  |
| $52,000 - $65,999 | 1.06 (0.99 to 1.13) | 0.086 |
| $66,000 - $87,999 | 1.06 (0.98 to 1.13) | 0.14 |
| $88,000 or more | 1.16 (1.07 to 1.27) | <0.001 |
| Expected primary payer |  |  |
| Private | — |  |
| Medicaid | 0.95 (0.87 to 1.03) | 0.20 |
| Medicare | 0.95 (0.89 to 1.01) | 0.073 |
| Other | 0.94 (0.81 to 1.09) | 0.40 |
| Hospital region |  |  |
| East North Central | — |  |
| East South Central | 1.35 (1.10 to 1.66) | 0.004 |
| Middle Atlantic | 0.89 (0.76 to 1.05) | 0.17 |
| Mountain | 1.28 (1.05 to 1.56) | 0.013 |
| New England | 0.90 (0.71 to 1.15) | 0.41 |
| Pacific | 1.23 (1.04 to 1.44) | 0.013 |
| South Atlantic | 1.25 (1.08 to 1.45) | 0.002 |
| West North Central | 1.07 (0.89 to 1.28) | 0.48 |
| West South Central | 1.09 (0.91 to 1.29) | 0.34 |
| Hospital bedsize |  |  |
| Large | — |  |
| Medium | 0.46 (0.41 to 0.51) | <0.001 |
| Small | 0.22 (0.18 to 0.26) | <0.001 |
| Hospital location and teaching status |  |  |
| Rural | — |  |
| Urban, non-teaching | 11.3 (5.76 to 22.1) | <0.001 |
| Urban, teaching | 39.1 (20.6 to 74.3) | <0.001 |
| *1*OR = Odds Ratio, CI = Confidence Interval | | |