Impact of Atrial Fibrillation on In-Hospital Outcomes in Infective Endocarditis Patients

Analysis for RCOP NIS Cardio8

Eliza Aisha

## Preamble:

* **Reference Papers:**
  + [Sidhu et al. 2022](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9207776/pdf/main.pdf)
* **Study Objective**: Examine the impact of atrial fibrillation on in-hospital outcomes among inpatient admissions with a principal diagnosis of infective endocarditis.
* **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 infective endocarditis
* **Infective Endocarditis + Atrial Fibrillation Categories**:
  + Infective Endocarditis with Atrial Fibrillation
  + Infective Endocarditis without Atrial Fibrillation
* **Primary Outcomes**:
  + In-hospital all-cause mortality
  + Total hospital length of stay (days)
  + Total charge, inflation adjusted to 2020 ($)
* **Secondary Outcomes**:
  + Acute Renal Failure
  + Acute Ischemic Stroke
  + Acute Heart Failure
* **Statistical Analysis**: Multiple logistic and linear regression to determine the independent association of atrial fibrillation with in-hospital outcomes, respectively, adjusted for:
  + Demographics: Age, sex, race, residential income, insurance, and hospital region,
  + Medical History: Hypertension, diabetes mellitus, hyperlipidemia, coronary artery disease, peripheral vascular disease, heart failure, chronic kidney disease, chronic obstructive pulmonary disease, dementia, liver disease, obstructive sleep apnea, anemia, obesity, alochol use disorder, prior stroke, prior cardiac surgery, presence of pacemaker/defibrillator, and tobacco use disorder.
  + 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 = 42,075*1* | **Infective Endcarditis without Atrial Fibrillation** N = 34,750*1* | **Infective Endcarditis with Atrial Fibrillation** N = 7,325*1* | **p-value***2* |
| --- | --- | --- | --- | --- |
| Age, y | 51 (20) | 48 (19) | 67 (15) | <0.001 |
| Sex |  |  |  | <0.001 |
| Female | 17,385 (41%) | 14,645 (42%) | 2,740 (37%) |  |
| Male | 24,690 (59%) | 20,105 (58%) | 4,585 (63%) |  |
| Race |  |  |  | <0.001 |
| White | 31,315 (77%) | 25,615 (76%) | 5,700 (81%) |  |
| Asian or Pacific Islander | 710 (1.7%) | 535 (1.6%) | 175 (2.5%) |  |
| Black | 4,340 (11%) | 3,740 (11%) | 600 (8.5%) |  |
| Hispanic | 3,175 (7.8%) | 2,740 (8.1%) | 435 (6.2%) |  |
| Native American | 390 (1.0%) | 360 (1.1%) | 30 (0.4%) |  |
| Other | 955 (2.3%) | 830 (2.5%) | 125 (1.8%) |  |
| Charlson comorbidity index | 2.08 (2.17) | 1.84 (2.08) | 3.19 (2.24) | <0.001 |
| Residential income |  |  |  | <0.001 |
| $1 - $51,999 | 13,525 (33%) | 11,535 (34%) | 1,990 (28%) |  |
| $52,000 - $65,999 | 10,930 (27%) | 9,265 (28%) | 1,665 (23%) |  |
| $66,000 - $87,999 | 9,175 (22%) | 7,290 (22%) | 1,885 (26%) |  |
| $88,000 or more | 7,230 (18%) | 5,570 (17%) | 1,660 (23%) |  |
| Expected primary payer |  |  |  | <0.001 |
| Private | 12,120 (29%) | 10,505 (30%) | 1,615 (22%) |  |
| Medicaid | 14,185 (34%) | 13,415 (39%) | 770 (11%) |  |
| Medicare | 14,590 (35%) | 9,870 (28%) | 4,720 (64%) |  |
| Other | 1,135 (2.7%) | 915 (2.6%) | 220 (3.0%) |  |
| Hospital region |  |  |  | <0.001 |
| Midwest | 8,835 (21%) | 7,010 (20%) | 1,825 (25%) |  |
| Northeast | 9,340 (22%) | 7,745 (22%) | 1,595 (22%) |  |
| South | 16,375 (39%) | 13,840 (40%) | 2,535 (35%) |  |
| West | 7,525 (18%) | 6,155 (18%) | 1,370 (19%) |  |
| Hypertension | 20,640 (49%) | 15,035 (43%) | 5,605 (77%) | <0.001 |
| Diabetes mellitus | 9,155 (22%) | 6,585 (19%) | 2,570 (35%) | <0.001 |
| Hyperlipidemia | 10,470 (25%) | 7,010 (20%) | 3,460 (47%) | <0.001 |
| Coronary artery disease | 7,670 (18%) | 4,910 (14%) | 2,760 (38%) | <0.001 |
| Peripheral vascular disease | 3,325 (7.9%) | 2,185 (6.3%) | 1,140 (16%) | <0.001 |
| Heart failure | 13,840 (33%) | 9,405 (27%) | 4,435 (61%) | <0.001 |
| Chronic kidney disease | 8,435 (20%) | 5,975 (17%) | 2,460 (34%) | <0.001 |
| Chronic obstructive pulmonary disease | 7,360 (17%) | 5,615 (16%) | 1,745 (24%) | <0.001 |
| Dementia | 1,300 (3.1%) | 870 (2.5%) | 430 (5.9%) | <0.001 |
| Liver disease | 6,545 (16%) | 5,810 (17%) | 735 (10%) | <0.001 |
| Obstructive sleep apnea | 2,635 (6.3%) | 1,680 (4.8%) | 955 (13%) | <0.001 |
| Anemia | 4,780 (11%) | 3,990 (11%) | 790 (11%) | 0.4 |
| Alcohol use disorder | 12,640 (30%) | 10,315 (30%) | 2,325 (32%) | 0.14 |
| Obesity | 5,025 (12%) | 3,725 (11%) | 1,300 (18%) | <0.001 |
| Prior stroke | 3,785 (9.0%) | 2,635 (7.6%) | 1,150 (16%) | <0.001 |
| Prior cardiac surgery | 5,115 (12%) | 3,485 (10%) | 1,630 (22%) | <0.001 |
| Pacemaker/ICD | 2,250 (5.3%) | 1,260 (3.6%) | 990 (14%) | <0.001 |
| Tobbacco use disorder | 545 (1.3%) | 515 (1.5%) | 30 (0.4%) | 0.001 |
| *1*Mean (SD); n (%) | | | | |
| *2*Design-based KruskalWallis test; Pearson's X^2: Rao & Scott adjustment | | | | |

## Outcomes Table:

| **Characteristic** | **Overall** N = 42,075*1* | **Infective Endcarditis without Atrial Fibrillation** N = 34,750*1* | **Infective Endcarditis with Atrial Fibrillation** N = 7,325*1* | **p-value***2* |
| --- | --- | --- | --- | --- |
| Died during hospitalization | 1,620 (3.9%) | 1,210 (3.5%) | 410 (5.6%) | <0.001 |
| Length of stay (days) | 12 (13) | 12 (13) | 13 (13) | <0.001 |
| Inflation-adjusted total charge ($) | 157,098 (248,192) | 149,393 (245,458) | 193,633 (257,734) | <0.001 |
| Acute renal failure | 10,285 (24%) | 7,780 (22%) | 2,505 (34%) | <0.001 |
| Acute ischemic stroke | 3,715 (8.8%) | 2,835 (8.2%) | 880 (12%) | <0.001 |
| Acute heart failure | 3,720 (8.8%) | 2,210 (6.4%) | 1,510 (21%) | <0.001 |
| *1*n (%); Mean (SD) | | | | |
| *2*Pearson's X^2: Rao & Scott adjustment; Design-based KruskalWallis test | | | | |

## Multivariable Logistic Regression:

### All-Cause Mortality:

### Acute Renal Failure:

### Acute Ischemic Stroke:

### Acute Heart Failure:

## Multivariable Linear Regression:

### Length of Stay:

| **Characteristic** | **Beta** | **95% CI***1* | **p-value** |
| --- | --- | --- | --- |
| Atrial fibrillation categories |  |  |  |
| Infective Endcarditis without Atrial Fibrillation | — | — |  |
| Infective Endcarditis with Atrial Fibrillation | 2.6 | 1.8, 3.5 | <0.001 |
| Age, y | -0.07 | -0.10, -0.04 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | -0.18 | -0.79, 0.43 | 0.6 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 1.6 | -0.48, 3.6 | 0.13 |
| Black | 0.56 | -0.54, 1.7 | 0.3 |
| Hispanic | 0.06 | -1.0, 1.1 | >0.9 |
| Native American | 0.62 | -2.2, 3.5 | 0.7 |
| Other | 3.9 | -0.07, 7.8 | 0.054 |
| Charlson comorbidity index | 0.63 | 0.42, 0.83 | <0.001 |
| Residential income |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 0.00 | -0.78, 0.79 | >0.9 |
| $66,000 - $87,999 | -0.01 | -0.80, 0.78 | >0.9 |
| $88,000 or more | -0.88 | -1.7, -0.02 | 0.044 |
| Expected primary payer |  |  |  |
| Private | — | — |  |
| Medicaid | 0.83 | 0.00, 1.7 | 0.049 |
| Medicare | -0.29 | -1.2, 0.59 | 0.5 |
| Other | -0.76 | -2.4, 0.92 | 0.4 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 1.0 | 0.03, 2.0 | 0.043 |
| South | 2.2 | 1.2, 3.1 | <0.001 |
| West | 0.15 | -0.85, 1.2 | 0.8 |
| Hypertension |  |  |  |
| No | — | — |  |
| Yes | 0.45 | -0.29, 1.2 | 0.2 |
| Diabetes mellitus |  |  |  |
| No | — | — |  |
| Yes | -0.46 | -1.3, 0.34 | 0.3 |
| Hyperlipidemia |  |  |  |
| No | — | — |  |
| Yes | -1.8 | -2.5, -1.2 | <0.001 |
| Coronary artery disease |  |  |  |
| No | — | — |  |
| Yes | 0.19 | -0.51, 0.89 | 0.6 |
| Peripheral vascular disease |  |  |  |
| No | — | — |  |
| Yes | -0.62 | -1.8, 0.60 | 0.3 |
| Heart failure |  |  |  |
| No | — | — |  |
| Yes | 2.5 | 1.8, 3.2 | <0.001 |
| Chronic kidney disease |  |  |  |
| No | — | — |  |
| Yes | -0.37 | -1.4, 0.65 | 0.5 |
| Chronic obstructive pulmonary disease |  |  |  |
| No | — | — |  |
| Yes | -0.71 | -1.5, 0.06 | 0.072 |
| Dementia |  |  |  |
| No | — | — |  |
| Yes | -0.91 | -2.0, 0.21 | 0.11 |
| Liver disease |  |  |  |
| No | — | — |  |
| Yes | 1.6 | 0.67, 2.5 | <0.001 |
| Obstructive sleep apnea |  |  |  |
| No | — | — |  |
| Yes | -0.72 | -1.6, 0.16 | 0.11 |
| Anemia |  |  |  |
| No | — | — |  |
| Yes | 1.8 | 0.98, 2.7 | <0.001 |
| Alcohol use disorder |  |  |  |
| No | — | — |  |
| Yes | 0.24 | -0.50, 0.99 | 0.5 |
| Obesity |  |  |  |
| No | — | — |  |
| Yes | 0.09 | -0.66, 0.85 | 0.8 |
| Prior stroke |  |  |  |
| No | — | — |  |
| Yes | -0.84 | -1.8, 0.11 | 0.084 |
| Prior cardiac surgery |  |  |  |
| No | — | — |  |
| Yes | -2.9 | -3.7, -2.1 | <0.001 |
| Pacemaker/ICD |  |  |  |
| No | — | — |  |
| Yes | -1.1 | -2.7, 0.56 | 0.2 |
| Tobbacco use disorder |  |  |  |
| No | — | — |  |
| Yes | -2.0 | -4.3, 0.28 | 0.086 |
| *1*CI = Confidence Interval | | | |

### Inflation Adjusted Total Charge:

| **Characteristic** | **Beta** | **95% CI***1* | **p-value** |
| --- | --- | --- | --- |
| Atrial fibrillation categories |  |  |  |
| Infective Endcarditis without Atrial Fibrillation | — | — |  |
| Infective Endcarditis with Atrial Fibrillation | 42,896 | 25,638, 60,153 | <0.001 |
| Age, y | -1,182 | -1,681, -683 | <0.001 |
| Sex |  |  |  |
| Female | — | — |  |
| Male | 3,104 | -7,879, 14,088 | 0.6 |
| Race |  |  |  |
| White | — | — |  |
| Asian or Pacific Islander | 25,827 | -21,432, 73,087 | 0.3 |
| Black | 31,296 | 11,100, 51,492 | 0.002 |
| Hispanic | 26,503 | 1,058, 51,947 | 0.041 |
| Native American | -32,963 | -69,955, 4,029 | 0.081 |
| Other | 102,136 | 24,029, 180,243 | 0.010 |
| Charlson comorbidity index | 12,135 | 7,771, 16,499 | <0.001 |
| Residential income |  |  |  |
| $1 - $51,999 | — | — |  |
| $52,000 - $65,999 | 279 | -13,348, 13,906 | >0.9 |
| $66,000 - $87,999 | 5,171 | -10,226, 20,569 | 0.5 |
| $88,000 or more | -64 | -16,778, 16,649 | >0.9 |
| Expected primary payer |  |  |  |
| Private | — | — |  |
| Medicaid | -26,778 | -41,122, -12,435 | <0.001 |
| Medicare | -11,399 | -28,330, 5,532 | 0.2 |
| Other | -1,657 | -33,004, 29,689 | >0.9 |
| Hospital region |  |  |  |
| Midwest | — | — |  |
| Northeast | 36,933 | 14,983, 58,882 | <0.001 |
| South | 9,234 | -5,991, 24,459 | 0.2 |
| West | 69,553 | 46,838, 92,268 | <0.001 |
| Hypertension |  |  |  |
| No | — | — |  |
| Yes | 13,122 | -728, 26,972 | 0.063 |
| Diabetes mellitus |  |  |  |
| No | — | — |  |
| Yes | -12,137 | -27,324, 3,051 | 0.12 |
| Hyperlipidemia |  |  |  |
| No | — | — |  |
| Yes | -23,717 | -37,307, -10,127 | <0.001 |
| Coronary artery disease |  |  |  |
| No | — | — |  |
| Yes | 23,809 | 7,601, 40,017 | 0.004 |
| Peripheral vascular disease |  |  |  |
| No | — | — |  |
| Yes | -1,712 | -26,307, 22,882 | 0.9 |
| Heart failure |  |  |  |
| No | — | — |  |
| Yes | 79,016 | 62,806, 95,225 | <0.001 |
| Chronic kidney disease |  |  |  |
| No | — | — |  |
| Yes | -22,363 | -42,753, -1,972 | 0.032 |
| Chronic obstructive pulmonary disease |  |  |  |
| No | — | — |  |
| Yes | -23,870 | -37,815, -9,924 | <0.001 |
| Dementia |  |  |  |
| No | — | — |  |
| Yes | -55,877 | -75,899, -35,855 | <0.001 |
| Liver disease |  |  |  |
| No | — | — |  |
| Yes | 19,496 | 1,356, 37,637 | 0.035 |
| Obstructive sleep apnea |  |  |  |
| No | — | — |  |
| Yes | -8,530 | -28,146, 11,086 | 0.4 |
| Anemia |  |  |  |
| No | — | — |  |
| Yes | 7,309 | -6,946, 21,564 | 0.3 |
| Alcohol use disorder |  |  |  |
| No | — | — |  |
| Yes | 8,204 | -5,860, 22,267 | 0.3 |
| Obesity |  |  |  |
| No | — | — |  |
| Yes | 9,247 | -6,160, 24,653 | 0.2 |
| Prior stroke |  |  |  |
| No | — | — |  |
| Yes | -13,112 | -30,847, 4,622 | 0.15 |
| Prior cardiac surgery |  |  |  |
| No | — | — |  |
| Yes | -67,839 | -82,821, -52,857 | <0.001 |
| Pacemaker/ICD |  |  |  |
| No | — | — |  |
| Yes | -36,524 | -69,428, -3,619 | 0.030 |
| Tobbacco use disorder |  |  |  |
| No | — | — |  |
| Yes | -8,365 | -53,044, 36,313 | 0.7 |
| *1*CI = Confidence Interval | | | |