No Mental Illness Impact on Post-Aortic Valve Replacement Patients’ New-Onset Atrial Fibrillation

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Kolba, Natalie; Dokko, Julia; Novotny, Samantha; Agha, Sohaib; Yaligar, Ashutosh; Parikh, Puja; Pryor, Aurora; Tannous, Henry; Shroyer, Laurie; and Bilfinger, Thomas, "No Mental Illness Impact on Post-Aortic Valve Replacement Patients' New-Onset Atrial Fibrillation" (2022). Department of Surgery Faculty Publications. 4.
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**TITLE:** Mental Illness and New-Onset Postoperative Atrial Fibrillation in First-time and Repeat Surgical and Valve-in-Valve Transcatheter Aortic Valve Replacement

**Authors:** Natalie Kolba¹, Julia Dokko¹, Samantha Novotny¹, Xiaoyue Zhang, MS², Jie Yang, PhD², Sohaib Agha³, Ashutosh Yaligar³, Puja B. Parikh, MD, MPH⁴, Aurora D. Pryor, MD³, Henry J. Tannous, MD³, A. Laurie Shroyer, PhD³*, and Thomas Bilfinger, MD, ScD³*

**PURPOSE AND SPECIFIC AIMS:**

Using publicly available Statewide Planning and Research Cooperative System (SPARCS) de-identified data reports, this retrospective, observational cohort study will identify the New York State (NYS)-based rates for first time and repeat aortic valve replacement procedures. For these patients, their risk profiles, treatment rates, and short-term outcome rates will be evaluated. For our short-term outcomes, new onset postoperative atrial fibrillation, 30-day readmission rates, and 30-day STS composite outcomes will be evaluated.

Additionally, the following hypotheses will be tested:

H(0): There will be no difference in post-first time and repeat aortic valve replacement outcomes between populations with mental illness vs without mental illness for New York State between the time range 2005-2018.

*Please note, the SPARCS database reports will be de-identified. As noted on the SPARCS website, “Public use data files contain de-identified data consisting of basic record-level detail. Public use files do not contain protected health information (PHI) under HIPAA.”*

**BACKGROUND AND SIGNIFICANCE:**

There is increased prevalence of symptomatic aortic stenosis (AS) with age, a condition associated with a high chance of death when untreated (Bonow & Greenland, 2015). The current standard of care for patients with aortic disease (aortic stenosis and regurgitation) who are at a high or prohibitive risk for surgical aortic valve replacement (SAVR) is the transcatheter aortic valve replacement (TAVR) procedure (Leon et al, 2016). When a patient has to undergo a repeat AVR procedure, there are additional risks that can lead to worse outcomes. The current literature states that the in-hospital mortality rate for patients undergoing rAVR ranges between 2.3% and 17.6% (Leontyev et al, 2011). Certain risk factors such as female gender, history of coronary artery disease, and lower creatinine clearance were found to be independent predictors of early mortality (Francois et al, 2020). An additional risk factor not well identified in previous literature is a pre-operative diagnosis of a mental illness. This is a gap in knowledge because patients with mental illnesses have a higher incidence of cardiovascular disease and comorbidities (Correll et al, 2017). The focus of the current study is to fill this gap by using The New York State Statewide Planning and Research Cooperative System (SPARCS) database.

**RESEARCH DESIGN AND METHODS:**
All analyses were performed using SAS 9.4 by an institutional core facility of data analytics. Chi square tests with exact p-value from Monte Carlo simulation were used for categorical variables and Welch’s t-test used for continuous variables. Cardiovascular surgery and mental illness literature was reviewed to identify bivariable comparisons (p < 0.10) that were model eligible variables for multivariable logistic regression predicting POAF/AFL, STS MM, and READMIT. These variables were further refined (e.g., selecting domain-specific variables to address inherent collinearity), as appropriate. For the analyses performed, the statistical significance threshold was set at p ≤ 0.05.

This study’s PICOS components include:

**Population:** All New York State patients having undergone aortic valve replacement and repeat aortic valve replacement, excluding patients <18 yo, emergency admissions, and patients with previous aortic dissections. Patients who had a concomitant or 2-year prior coronary artery bypass graft surgery (CABG), thoracic aortic aneurysm repair (TAA) or mitral valve repair/replacement were also excluded.

**Intervention:** Documenting rates of preoperative diagnosis of mental illness.

**Comparison:** Risk factors, mental illness diagnosis before the procedure, patient demographics.

**Outcomes:** New onset post operative atrial fibrillation, 30-day readmission, 30-day STS composite endpoint.

**Study Design:** This study is a retrospective observational cohort study using SPARCS de-identified database.

**REFERENCES**


**Codes:**

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<td>Atrial Fibrillation/Flutter, n (%)</td>
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<td>&gt; 40.0</td>
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<td>Dyspnea, n (%)</td>
<td>R06.00, R06.01, R06.02, R06.03, R06.09</td>
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<td>Rheumatic Heart Disease, n (%)</td>
<td>I06.0, I06.2, I08.0, I08.2, I08.3, I335.0, I35.2, I06.1, I35.1</td>
<td>395.0, 395.2</td>
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</table>

**Psychiatric Disease-related Risk Factors**

| Opioid abuse, n (%)                              | F11.20, F11.21, F11.22, Z79.891, Z79.899                                  | 304.01- 304.03, 305.50-305.53 |
| Family history of other mental health and behavioral disorders, n (%) | Z81.8, V17.0                                                             | V17.0 |
| Suicide ideation, n (%)                          | R45.851                                                                    | V62.84 |
| Suicide attempt, n (%)                           | T14.91                                                                     | E950-E959 |
| Intracranial injury, n (%)                       | S09.90, S06                                                               | 959.01, 854 |
| Age related physical debility, n (%)             | R54                                                                        | 797 |
| Frailty (mental), n (%)                          | R41.81                                                                     | 797 |
| Abnormal EEG, n (%)                              | R94.01                                                                     | 794.02 |
| Autoimmune disease, n (%)                        | D89.9                                                                     | 273.279 |
| Acquired coagulation factor deficiency, n (%)    | D68.4                                                                      | 286.7 |
| Abnormal leukocyte count, n (%)                  | D72.829                                                                   | 288.6 |

**Other Psychiatric Disease-related Diagnoses**

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<tr>
<th>Diagnosis</th>
<th>ICD-10 codes</th>
<th>Percentage</th>
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<td>Rheumatic Heart Disease, n (%)</td>
<td>I06.0, I06.2, I08.0, I08.2, I08.3, I335.0, I35.2, I06.1, I35.1</td>
<td>395.0, 395.2</td>
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<td>PTSD n, (%)</td>
<td>F43.1, F43.10-F43.12</td>
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<td>PTSD-related (adjustment disorder and stress) n, (%)</td>
<td>F43.21, F43.22, F43.23, F43.25, F43.29, F43.30, F43.3, F43.8, F43.9</td>
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<td>Generalized Anxiety Disorder, n (%)</td>
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<td>Alcohol-induced mental disorders</td>
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<td>Obsessive Compulsive Disorder, n (%)</td>
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<td>Schizophrenia, n (%)</td>
<td>F41.0, F41.1, F41.3, F41.8, F41.9</td>
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<td>Mild cognitive impairment, n (%)</td>
<td>G31.84</td>
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<td>Dementia, n (%)</td>
<td>F03.90</td>
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<td>Complications</td>
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<td>Ventilator Status, n (%)</td>
<td>Z99.11 (dependence on respirator [ventilator] status)</td>
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<td>Bleeding/Vascular Complications, n (%)</td>
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<td>Post-Procedural Pacemaker placement, n (%)</td>
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<td>Prosthetic valve endocarditis, n (%)</td>
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<td>Aortic insufficiency, n (%)</td>
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<td>Patient medical non-compliance, n (%)</td>
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SAMPLE TABLE 1: Descriptive table of SAVR/TAVR patients' baseline characteristics, risk factors and Elixhauser comorbidities by mental illness

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**SAMPLE TABLE 2:** Mental illness sub-type distribution among first-time SAVRTAVR patients

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<th>Percent among all First-Time SAVRTAVR patients (%)</th>
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<td>Anxiety</td>
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<td>Obsessive Compulsive Disorder</td>
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<td>Bipolar Disorder</td>
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<td>Mild cognitive impairment</td>
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**SAMPLE TABLE 3:** MH breakdown table among First-SAVRTAVR patients

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**Overall**
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<th>Generalized anxiety disorder</th>
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