

SUPPLEMENTAL MATERIAL

Table S1. List of the International Classification of Diseases Codes Used in the Study.

<p>Mitral Valve Replacement</p>	<p>* Tissue valve replacement: 35.23 Open and other replacement of mitral valve with tissue graft 02RG07Z Replacement of Mitral Valve with Autologous Tissue Substitute, Open Approach 02RG08Z Replacement of Mitral Valve with Zooplastic Tissue, Open Approach 02RG0KZ Replacement of Mitral Valve with Nonautologous Tissue Substitute, Open Approach * Mechanical valve replacement: 35.24 Open and other replacement of mitral valve 02RG0JZ Replacement of Mitral Valve with Synthetic Substitute, Open Approach</p>
<p>Aortic Valve Replacement</p>	<p>* Tissue valve replacement: 35.21 Replacement of aortic valve with tissue graft 02RF07Z Replacement of Aortic Valve with Autologous Tissue Substitute, Open Approach 02RF08Z Replacement of Aortic Valve with Zooplastic Tissue, Open Approach 02RF0KZ Replacement of Aortic Valve with Nonautologous Tissue Substitute, Open Approach * Mechanical valve replacement: 35.22 Other replacement of aortic valve 02RF0JZ Replacement of Aortic Valve with Synthetic Substitute, Open Approach</p>
<p>Surgical Left Atrial Appendage Exclusion</p>	<p>ICD-9-CM 37.36 ICD-10-CM 02570ZK Destruction of Left Atrial Appendage, Open Approach 02B70ZK Excision of Left Atrial Appendage, Open Approach 02L70ZK Occlusion of Left Atrial Appendage, Open Approach 02L70CK Occlusion of left atrial appendage with extraluminal device, open</p>
<p>Surgical MAZE</p>	<p>ICD-9-CM 37.33 ICD-10-CM 02570ZZ Destruction of Left Atrium, Open Approach 02B70ZZ Excision of Left Atrium, Open Approach 02574ZZ Destruction of Left Atrium, Percutaneous Endoscopic 02B74ZZ Excision of Left Atrium, Percutaneous Endoscopic Approach</p>
<p>Coronary Artery Bypass Grafting</p>	<p>ICD-9-CM: 3610, 3611, 3612, 3613, 3614, 3615, 3616, 3617, 3619 ICD-10-CM: 02130KW, 02130Z3, 02130Z8, 02130Z9, 02130ZC, 02130ZF, 02130K8, 02130K9, 02130KC, 02130KF, 02130A9, 02130AC, 02130AF, 02130AW 02130J3, 02130J8 02130J9, 02130JC 02130JF, 02130JW 02130K3, 02120Z8, 02120Z9, 02120ZC, 02120ZF, 0213093, 0213098, 0213099, 021309C, 021309F, 021309W, 02130A3, 02130A8, 02120AW, 02120J3, 02120J8, 02120J9, 02120JC, 02120JF, 02120JW, 02120K3, 02120K8 02120K9, 02120KC 02120KF, 02120KW, 02120Z3, 02110Z9, 02110ZC, 02110ZF 0212093, 0212098, 0212099, 021209C, 021209F, 021209W, 02120A3, 02120A8, 02120A9, 02120AC 02120AF, 02110J3, 02110J8, 02110J9, 02110JC, 02110JF, 02110JW, 02110K3, 02110K8, 02110K9, 02110KC, 02110KF, 02110KW, 02110Z3, 02110Z8, 02100ZC 02100ZF 0211093 0211098, 0211099, 021109C, 021109F, 021109W, 02110A3, 02110A8, 02110A9, 02110AC, 02110AF, 02110AW, 02100J3, 02100K9, 02100KC, 02100KF, 02100KW, 02100Z3, 02100Z8, 02100Z9, 0210093, 0210099, 021009C, 021009F, 021009W, 02100A3, 02100A8, 02100A9, 02100AC, 02100AF, 02100AW</p>

Table S2. Utilization of Mechanical Prostheses Among Patients ≤ 70 years of age Undergoing Aortic or Mitral Valve Replacement Stratified by Age Group.

Age Group	Valve	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
50-55	Aortic	59.8%	56.0%	57.3%	58.8%	58.5%	57.1%	53.1%	45.6%	36.2%	35.9%
	Mitral	72.6%	69.7%	70.5%	63.9%	64.8%	70.5%	67.6%	62.2%	48.5%	47.9%
56-60	Aortic	51.5%	44.3%	47.0%	51.7%	48.0%	46.2%	45.1%	39.2%	23.4%	22.4%
	Mitral	66.3%	58.1%	67.2%	64.7%	67.3%	58.3%	59.6%	56.4%	42.2%	36.8%
61-65	Aortic	43.4%	37.0%	39.2%	37.5%	39.8%	37.5%	35.6%	31.0%	17.5%	14.5%
	Mitral	54.9%	51.3%	53.8%	51.7%	51.5%	54.8%	45.5%	44.8%	28.8%	25.6%
66-70	Aortic	33.6%	32.2%	33.3%	33.3%	32.9%	32.0%	30.5%	24.2%	12.9%	9.4%
	Mitral	46.7%	42.4%	43.6%	41.8%	41.4%	40.3%	36.1%	33.0%	20.5%	18.1%

Table S3. Predictors of Utilization of Mechanical Prostheses Among Patients Undergoing Aortic Valve Replacement (Univariate Logistical Regression).

Variables	Odd Ratio	95% CI		P-value
		Lower	Upper	
Age				
50-55	Reference	Reference	Reference	Reference
56-60	0.65	0.64	0.67	<0.001
61-65	0.45	0.44	0.46	<0.001
66-70	0.33	0.33	0.34	<0.001
Female	1.06	1.04	1.08	<0.001
Race				
White	Reference	Reference	Reference	Reference
Black	1.29	1.25	1.33	<0.001
Hispanic	1.29	1.25	1.33	<0.001
Diabetes	0.82	0.81	0.84	<0.001
Hypertension	0.88	0.86	0.89	<0.001
Congestive Heart Failure	0.47	0.45	0.48	<0.001
Peripheral Vascular Disease	1.12	1.10	1.14	<0.001
Carotid Artery Disease	0.75	0.71	0.78	<0.001
Chronic Kidney Disease	1.11	1.08	1.14	<0.001
Chronic Lung Disease	1.03	1.01	1.05	0.003
Anemia	1.05	1.02	1.07	<0.001
Liver Disease	0.84	0.78	0.92	<0.001
Atrial Fibrillation	0.86	0.84	0.87	<0.001
Conduction Disorders	0.89	0.86	0.93	<0.001
Prior Defibrillator	1.40	1.27	1.55	<0.001
Prior Sternotomy	1.42	1.37	1.47	<0.001
Prior Stroke	0.91	0.87	0.94	<0.001
Non-Elective	1.10	1.08	1.12	<0.001
Teaching Hospital	0.72	0.70	0.73	<0.001
Median Household Income				
0-25 th percentile	Reference	Reference	Reference	Reference
26 th -50 th percentile	0.89	0.87	0.91	<0.001
51 st -75 th percentile	0.83	0.81	0.85	<0.001
76 th -100 th percentile	0.70	0.68	0.71	<0.001
Hospital Region				
Northeast	Reference	Reference	Reference	Reference
Midwest	1.43	1.39	1.46	<0.001
South	1.73	1.69	1.77	<0.001
West	1.40	1.36	1.44	<0.001
Rural location	1.34	1.27	1.41	<0.001
Coronary Bypass Grafting	0.93	0.92	0.95	<0.001
Bicuspid Aortic Valve	0.78	0.76	0.79	<0.001

Table S4. Predictors of Utilization of Mechanical Prostheses Among Patients Undergoing Aortic Valve Replacement (Multivariable Logistic Regression) After Removing Atrial Fibrillation from the Model.

Variables	Odd Ratio	95% CI		P-value
		Lower	Upper	
Age				
50-55	Reference	Reference	Reference	Reference
56-60	0.64	0.62	0.66	<0.001
61-65	0.43	0.42	0.44	<0.001
66-70	0.31	0.30	0.32	<0.001
Female	1.10	1.08	1.12	<0.001
Race				
White	Reference	Reference	Reference	Reference
Black	1.09	1.05	1.13	<0.001
Hispanic	1.19	1.15	1.23	<0.001
Diabetes	0.88	0.87	0.90	<0.001
Hypertension	0.96	0.94	0.97	<0.001
Congestive Heart Failure	0.46	0.45	0.48	<0.001
Peripheral Vascular Disease	1.13	1.11	1.16	<0.001
Carotid Artery Disease	0.80	0.76	0.84	<0.001
Chronic Kidney Disease	0.98	0.96	1.01	0.25
Chronic Lung Disease	1.00	0.98	1.02	0.87
Anemia	1.01	0.99	1.03	0.42
Liver Disease	0.79	0.72	0.86	<0.001
Conduction Disorders	0.98	0.94	1.02	0.35
Prior Defibrillator	1.27	1.14	1.40	<0.001
Prior Sternotomy	1.52	1.46	1.58	<0.001
Prior Stroke	0.92	0.89	0.96	<0.001
Non-Elective	1.06	1.04	1.08	<0.001
Teaching Hospital	0.77	0.76	0.79	<0.001
Median Household Income				
0-25 th percentile	Reference	Reference	Reference	Reference
26 th -50 th percentile	0.95	0.93	0.98	<0.001
51 st -75 th percentile	0.92	0.90	0.95	<0.001
76 th -100 th percentile	0.82	0.80	0.84	<0.001
Hospital Region				
Northeast	Reference	Reference	Reference	Reference
Midwest	1.36	1.33	1.40	<0.001
South	1.61	1.57	1.65	<0.001
West	1.29	1.25	1.33	<0.001
Rural location	1.09	1.03	1.15	<0.001
Coronary Bypass Grafting	1.01	1.00	1.03	0.15
Bicuspid Aortic Valve	0.68	0.66	0.69	<0.001

Table S5. Predictors of Utilization of Mechanical Prostheses Among Patients Undergoing Mitral Valve Replacement (Univariate Logistical Regression).

Variables	Odd Ratio	95% CI		P-value
		Lower	Upper	
Age				
50-55	Reference	Reference	Reference	Reference
56-60	0.74	0.70	0.78	<0.001
61-65	0.47	0.45	0.49	<0.001
66-70	0.30	0.29	0.32	<0.001
Female	1.07	1.04	1.10	0.046
Race				
White	Reference	Reference	Reference	Reference
Black	0.97	0.93	1.02	<0.001
Hispanic	1.16	1.09	1.23	0.21
Diabetes	0.79	0.76	0.82	<0.001
Hypertension	0.83	0.80	0.85	<0.001
Congestive Heart Failure	0.47	0.45	0.49	<0.001
Peripheral Vascular Disease	0.69	0.65	0.72	<0.001
Carotid Artery Disease	0.68	0.61	0.76	<0.001
Chronic Kidney Disease	0.72	0.69	0.75	<0.001
Chronic Lung Disease	0.90	0.87	0.93	<0.001
Anemia	1.04	1.00	1.08	0.06
Liver Disease	0.77	0.68	0.88	<0.001
Atrial Fibrillation	1.15	1.12	1.20	<0.001
Conduction Disorders	0.87	0.80	0.94	0.001
Prior Defibrillator	1.26	1.12	1.42	<0.001
Prior Sternotomy	1.09	1.03	1.16	0.004
Prior Stroke	1.09	1.03	1.16	0.004
Non-Elective	0.87	0.84	0.90	<0.001
Teaching Hospital	0.78	0.75	0.81	<0.001
Median Household Income				
0-25 th percentile	Reference	Reference	Reference	Reference
26 th -50 th percentile	0.94	0.91	0.98	0.006
51 st -75 th percentile	0.93	0.89	0.97	<0.001
76 th -100 th percentile	0.73	0.70	0.76	<0.001
Hospital Region				
Northeast	Reference	Reference	Reference	Reference
Midwest	1.14	1.09	1.20	<0.001
South	1.32	1.26	1.38	<0.001
West	1.31	1.25	1.38	<0.001
Rural location	1.19	1.08	1.31	<0.001
Coronary Bypass Grafting	0.80	0.78	0.83	<0.001
Bicuspid Aortic Valve	0.93	0.90	0.97	<0.001

Table S6. Predictors of Utilization of Mechanical Prostheses Among Patients Undergoing Mitral Valve Replacement (Multivariable Logistic Regression) After Removing Atrial Fibrillation from the Model.

Variables	Odd Ratio	95% CI		P-value
		Lower	Upper	
Age				
50-55	Reference	Reference	Reference	Reference
56-60	0.76	0.72	0.80	<0.001
61-65	0.48	0.46	0.50	<0.001
66-70	0.31	0.30	0.33	<0.001
Female	1.03	1.00	1.07	0.07
Race				
White	Reference	Reference	Reference	Reference
Black	0.87	0.83	0.91	<0.001
Hispanic	1.04	0.98	1.11	0.23
Diabetes	0.92	0.89	0.95	<0.001
Hypertension	0.94	0.91	0.97	<0.001
Congestive Heart Failure	0.50	0.47	0.52	<0.001
Peripheral Vascular Disease	0.77	0.73	0.82	<0.001
Carotid Artery Disease	0.86	0.77	0.96	0.01
Chronic Kidney Disease	0.87	0.83	0.91	<0.001
Chronic Lung Disease	0.88	0.85	0.91	<0.001
Anemia	0.99	0.95	1.03	0.58
Liver Disease	0.80	0.70	0.92	<0.001
Conduction Disorders	1.02	0.93	1.11	0.73
Prior Defibrillator	1.13	1.00	1.28	0.06
Prior Sternotomy	1.24	1.16	1.32	<0.001
Prior Stroke	1.12	1.05	1.19	<0.001
Non-Elective	0.94	0.91	0.97	<0.001
Teaching Hospital	0.82	0.79	0.86	<0.001
Median Household Income				
0-25 th percentile	Reference	Reference	Reference	Reference
26 th -50 th percentile	0.95	0.91	0.99	0.02
51 st -75 th percentile	0.94	0.90	0.99	0.01
76 th -100 th percentile	0.76	0.72	0.79	<0.001
Hospital Region				
Northeast	Reference	Reference	Reference	Reference
Midwest	1.04	0.99	1.09	0.13
South	1.25	1.19	1.31	<0.001
West	1.22	1.16	1.29	<0.001
Rural location	0.98	0.88	1.09	0.73
Coronary Bypass Grafting	0.94	0.91	0.98	<0.001
Surgical MAZE/LAA	0.93	0.89	0.96	<0.001
Mitral Stenosis	1.30	1.24	1.36	<0.001