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## APPENDIX

### Codes for “Perioperative Combined Complication” and “Post-Operative Combined Complications” Variables

Combined Complications during the hospitalization for TJA surgery:

	ICD-9	ICD-10
Wound Infection, Wound Dehiscence	998.5x, 998.3; 998.0; 998.31; 998.32; 998.33	T81.31XA
Pulmonary Embolism	415.1, 415.19	I26.99
Cerebrovascular Event	433.01, 433.11, 433.21, 433.31, 433.81, 433.91, 434.01, 434.11, 434.91, 997.02	I63.22, I63.139, I63.239, I63.019, I63.119, I63.219, I63.59, I63.20, I63.30, I63.40, I63.50, I97.811, I97.821
Pulmonary Compromise	514, 518.4, 518.5, 518.81, 518.82, 997.3	J18.2, J18.1, J81.0, J96.00, J96.90, J80,
Cardiac Complications (non myocardial infarction)	426.0, 427.41, 427.42, 429.4, 997.1, 427.4, 427.3, 427.31, 427.32	I44.2, I49.01, I49.02, I97.0, I97.110, I97.130, I97.190, I97.710, I97.790, I97.88, I97.89, I48.91, I48.92
Pneumonia	481, 482.00- 482.99, 483, 485, 486, 507.0, 997.31, 997.39	J13, J18.1, J18.0, J18.9, J69.0, J95.851, J95.859, J95.88, J95.89
All Infections	590.1, 590.10, 590.11, 590.8, 590.81, 590.2, 590.9, 595.0, 595.9, 599.0, 567.0, 480, 480.0, 480.1,	N10, N16, N15.1, N15.9, N30.90, N30.91, J12.0, J12.1, J12.2, J12.89, J12.9, J13, J18.1, J15.0, J15.1, J14, <u>J15.4</u> , J15.3, J15.20,

	480.2, 480.8, 480.9, 481, 482.0, 482.1, 482.2, 482.3, 482.30, 482.31, 482.32, 482.39, 482.4, 482.40, 482.41, 482.42, 482.49, 482.5, 482.8, 482.81, 482.82, 482.83, 482.84, 482.89, 482.9, 483, 483.0, 483.1, 483.8, 485, 486, 487, 997.31, 038, 038.0, 038.1, 038.10, 038.11, 038.12, 038.19, 038.2, 038.3, 038.4, 038.40, 038.41, 038.42, 038.43, 038.44, 038.49, 038.8, 038.9, 790.7, 998.0, 958.4, 998.5, 998.59, 998.89, 785, 785.50, 785.52, 785.59, 999.39, 999.31, 999.3	<u>J15.211</u> , <u>J15.212</u> , <u>J15.29</u> , <u>J15.8</u> , <u>J15.5</u> , <u>J15.6</u> , <u>A48.1</u> , <u>J15.9</u> , <u>J15.7</u> , <u>J16.0</u> , <u>J16.8</u> , <u>J18.0</u> , <u>J18.9</u> , <u>J95.851</u> , <u>A40.9</u> , <u>A41.2</u> , <u>A41.01</u> , <u>A41.02</u> , <u>A41.1</u> , <u>A40.3</u> , <u>A41.4</u> , <u>A41.50</u> , <u>A41.3</u> , <u>A41.51</u> , <u>A41.52</u> , <u>A41.53</u> , <u>A41.59</u> , <u>A41.89</u> , <u>A41.9</u> , <u>R78.81</u> , <u>T79.4XXA</u> , <u>K68.11</u> , <u>T81.4XXA</u> , <u>T81.89XA</u> , <u>R57.9</u> , <u>R65.21</u> , <u>R57.1</u> , <u>R57.8</u> , <u>T80.29XA</u> , <u>T88.0XXA</u> , <u>T80.219A</u>
Acute Renal Failure	584, 584.5, 584.9	N17.0, N17.9
Gastrointestinal Complication	997.4, 560.1, 560.81, 560.9, 536.2, 537.3	K56.0, K56.7, K56.5, K56.60, R11.10, K31.5
Acute Myocardial Infarction	410.XX	I21.9
Mechanical ventilation	93.90, 96.7, 96.70, 96.71, 96.72 (CPT code) 94002, 94656, 94003, 94657	Z99.11
CNS Complication	997.0; 997.00; 997.01; 997.02; 997.09	G97.81, G97.82, G97.811, G97.821, G03.8, G97.0, G97.81, G97.82

Peripheral Vascular	9972	T81.719A, T81.72XA
Genitourinary Complication	997.5	N99.89
Hematoma or seroma	998.1, 998.11, 998.12, 998.13	
Deep Vein Thrombosis	453.4, 453.40, 453.41, 543.42	I82.409, I82.419, I82.429, I82.439, I82.4Y9, I82.449, I82.499, I82.4Z9
Acute Postoperative Hemorrhagic Anemia	285.1	D62
Delirium	293, 293.1, 292.81, 293.9, 780.09, 292.11, 292.12, 292.82, 348.3, 348.31, 348.39, 349.82, 780.97	G0430, G0431, G0439, G92, G9340, G9341, G9349, I674, I6783, P9160, P9161, P9162, P9163

**Table A1:** ratios and 95% confidence intervals reflective of Figures 1A-C

	2013	2014	2015	2016	2017	2018
<b>Preoperative Characteristics</b>						
<i>Median Age</i>	0.99 (0.99, 0.99)	0.99 (0.99, 0.99)	0.97 (0.97, 0.97)	0.97 (0.97, 0.99)	0.97 (0.99, 0.99)	0.97 (0.97, 0.99)
<i>Proportion Female</i>	1.15 (1.13, 1.18)	1.16 (1.13, 1.18)	1.15 (1.13, 1.18)	1.18 (1.15, 1.20)	1.16 (1.13, 1.18)	1.14 (1.11, 1.18)
<i>Deyo-Charlson &gt;0</i>	1.32 (1.28, 1.36)	1.32 (1.28, 1.35)	1.30 (1.27, 1.34)	1.29 (1.26, 1.33)	1.32 (1.28, 1.35)	1.32 (1.28, 1.37)
<b>Hospitalization Characteristics</b>						
<i>Combined Complications</i>	1.02 (0.99, 1.05)	1.02 (0.98, 1.05)	1.01 (0.98, 1.04)	1.09 (1.06, 1.13)	1.08 (1.04, 1.12)	1.11 (1.06, 1.16)
<i>Blood Transfusion</i>	1.55 (1.49, 1.62)	1.60 (1.52, 1.69)	1.63 (1.53, 1.73)	1.85 (1.71, 2.01)	1.84 (1.68, 2.01)	1.77 (1.56, 2.01)
<i>Extended Length of Stay</i>	1.37 (1.32, 1.42)	1.49 (1.43, 1.55)	1.51 (1.45, 1.57)	1.57 (1.50, 1.64)	1.63 (1.55, 1.71)	1.63 (1.52, 1.74)
<i>Median Medicare Payments (Related to Hospitalization)</i>	1.05 (1.02, 1.13)	1.05 (1.02, 1.11)	1.03 (1.02, 1.09)	1.04 (1.01, 1.08)	1.03 (1.01, 1.09)	1.05 (1.00, 1.14)
<b>Post-Discharge Characteristics</b>						
<i>90-Day Readmission</i>	1.38 (1.32, 1.44)	1.35 (1.30, 1.41)	1.26 (1.21, 1.32)	1.28 (1.22, 1.43)	1.23 (1.17, 1.29)	1.21 (1.13, 1.29)
<i>180-Day Readmission</i>	1.31 (1.26, 1.36)	1.28 (1.23, 1.34)	1.19 (1.15, 1.24)	1.22 (1.17, 1.27)	1.16 (1.11, 1.21)	1.14 (1.07, 1.20)
<i>Institutional Post-Acute Care</i>	1.40 (1.36, 1.44)	1.43 (1.39, 1.47)	1.41 (1.38, 1.45)	1.50 (1.45, 1.54)	1.57 (1.52, 1.62)	1.49 (1.43, 1.56)
<i>Median Medicare Payments Related To:</i>						
90-Day Readmissions	1.04 (1.03, 1.09)	1.06 (1.04, 1.07)	1.07 (1.04, 1.18)	1.10 (1.11, 1.11)	1.09 (1.05, 1.11)	1.03 (1.03, 1.06)
90-Day Outpatient Care	1.05 (1.02, 1.14)	1.05 (1.01, 1.13)	1.05 (1.02, 1.11)	1.04 (1.01, 1.15)	1.06 (1.12, 1.21)	1.05 (1.00, 1.14)
90-Day Skilled Nursing Facility Care	1.16 (1.12, 1.18)	1.19 (1.12, 1.24)	1.18 (1.13, 1.23)	1.16 (1.08, 1.19)	1.19 (1.12, 1.20)	1.17 (1.10, 1.22)

**Table A2:** Results from the unadjusted difference-in-differences analyses\* assessing if the CJR program coincided with changes in outcomes for White and Black patients, separately, and evaluating whether the CJR program coincided with reductions in racial differences (final two columns representing the difference-in-difference-in-differences analyses).

\*In this context, a difference-in-differences analysis compares differences between CJR and non-CJR hospitals in terms of observed outcomes when comparing the period prior to and after CJR implementation. **The difference-in-difference-in-differences analysis further assesses whether there is a racial difference in terms of outcome changes coinciding with CJR implementation.**

	Difference-in-Differences: White Patients		Difference-in-Differences: Black Patients		Difference-in-Difference- in-Differences: Black vs. White Patients	
	% change (95% CI)	p- value	% change (95% CI)	p- value	% change (95% CI)	p- value
<b>Preoperative Characteristics</b>						
<i>Age (continuous)</i>	-0.05 (-0.11,0.02)	0.175	0.22 (-0.07,0.50)	0.135	0.26 (-0.03,0.55)	0.079
<i>Proportion Female Patients</i>	0.21 (-0.17,0.58)	0.275	0.21 (-1.32,1.73)	0.791	-0.002 (-1.57,1.57)	0.999
<i>Deyo-Charlson Index Score &gt;1</i>	-0.03 (-0.41,0.35)	0.880	-0.16 (-1.84,1.52)	0.849	-0.13 (-1.86,1.59)	0.880
<b>Hospitalization Characteristics</b>						
<i>Combined Complications</i>	-1.27 (-1.70,-0.84)	<0.001	-1.36 (-3.27,0.56)	0.165	-0.09 (-2.05,1.88)	0.932
<i>Blood transfusion</i>	-0.06 (-0.21,0.09)	0.451	0.86 (0.03,1.7)	0.042	0.92 (0.08,1.77)	0.033
<i>Length of Stay (continuous)</i>	-1.95 (-2.28,-1.63)	<0.001	-0.92 (-2.34,0.51)	0.206	1.03 (-0.43,2.5)	0.166
<i>Medicare Payments (Related to Hospitalization)</i>	-0.04 (-0.27,0.19)	0.741	0.44 (-0.57,1.46)	0.390	0.48 (-0.56,1.52)	0.362
<b>Post-Discharge Characteristics</b>						
<i>90-day readmission</i>	-2.78 (-3.04,-2.53)	<0.001	-3.99 (-5.25,-2.73)	<0.001	-1.21 (-2.49,0.08)	0.067
<i>180-day readmission</i>	-2.68 (-2.95,-2.42)	<0.001	-3.81 (-5.08,-2.54)	<0.001	-1.13 (-2.43,0.17)	0.089
<i>Institutional Post-Acute Care</i>	-3.90 (-4.30,-3.50)	<0.001	-5.94 (-8.06,-3.81)	<0.001	-2.04 (-4.20,0.12)	0.065
<i>Medicare Payments Related To:</i>						
90-Day Readmissions	1.72 (-0.002,3.44)	0.050	3.09 (-3.66,9.84)	0.369	1.37 (-5.59,8.33)	0.700
90-Day Outpatient Care	2.02 (1.00,3.03)	<0.001	-5.26 (-9.78,-0.75)	0.022	-7.28 (-11.91,-2.65)	0.002
90-Day Skilled Nursing Facility Care	-15.01 (-16.17,-13.85)	<0.001	-16.97 (-21.26,-12.67)	<0.001	-1.96 (-6.40,2.49)	0.389

**Table A3:** Results from the adjusted difference-in-differences analyses\* assessing if the CJR program coincided with changes in outcomes for White and Black patients, separately, and evaluating whether the CJR program coincided with reductions in racial differences (final two columns representing the difference-in-difference-in-differences analyses).

\*In this context, a difference-in-differences analysis compares differences between CJR and non-CJR hospitals in terms of observed outcomes when comparing the period prior to and after CJR implementation. **The difference-in-difference-in-differences analysis further assesses whether there is a racial difference in terms of outcome changes coinciding with CJR implementation.**

	Difference-in-Differences: White Patients		Difference-in-Differences: Black Patients		Difference-in-Difference-in-Differences: Black vs. White Patients	
	% change (95% CI)	p-value	% change (95% CI)	p-value	% change (95% CI)	p-value
<b>Preoperative Characteristics</b>						
<i>Age (continuous)</i>	-0.03 (-0.09, 0.04)	0.3746	0.22 (-0.07, 0.50)	0.1340	0.24 (-0.04, 0.53)	0.0972
<i>Proportion Female Patients</i>	0.14 (-0.24, 0.51)	0.4777	0.12 (-1.40, 1.65)	0.8726	-0.01 (-1.58, 1.56)	0.9891
<i>Deyo-Charlson Index Score &gt;1</i>	-0.03 (-0.41, 0.36)	0.8983	-0.25 (-1.92, 1.42)	0.7692	-0.23 (-1.94, 1.49)	0.7968
<b>Hospitalization Characteristics</b>						
<i>Combined Complications</i>	-1.40 (-1.81, -0.98)	<0.0001	-1.44 (-3.32, 0.43)	0.1314	-0.05 (-1.97, 1.87)	0.9630
<i>Blood transfusion</i>	0.04 (-0.30, 0.37)	0.8449	0.72 (-3.32, 0.43)	0.3184	0.69 (-0.77, 2.15)	0.3542
<i>Length of Stay (continuous)</i>	-1.90 (-2.21, -1.59)	<0.0001	-0.81 (-2.17, 0.58)	0.2527	1.11 (-0.31, 2.56)	0.1261
<i>Medicare Payments (Related to Hospitalization)</i>	-0.07 (-0.30, 0.16)	0.5369	0.25 (-0.76, 1.26)	0.6328	0.32 (-0.71, 1.36)	0.5472
<b>Post-Discharge Characteristics</b>						
<i>90-day readmission</i>	-2.45 (-2.67, -2.23)	<0.0001	-3.83 (-4.95, -2.72)	<0.0001	-1.38 (-2.52, -0.25)	0.0172
<i>180-day readmission</i>	-2.38 (-2.63, -2.13)	<0.0001	-3.71 (-4.93, -2.49)	<0.0001	-1.33 (-2.57, -0.09)	0.0363
<i>Institutional Post-Acute Care</i>	-2.67 (-2.95, -2.40)	<0.0001	-5.30 (-6.89, -3.70)	<0.0001	-2.63 (-4.24, -1.01)	0.0015
<i>Medicare Payments Related To:</i>						
90-Day Readmissions	1.94 (0.20, 3.70)	0.0282	2.58 (-4.08, 9.70)	0.4568	0.63 (-6.10, 7.85)	0.8586
90-Day Outpatient Care	1.91 (0.88, 2.94)	0.0002	-4.33 (-8.53, 0.06)	0.0534	-6.12 (-10.34, -1.70)	0.0072
90-Day Skilled Nursing Facility Care	-13.85 (-14.83, -12.86)	<0.0001	-15.63 (-19.13, -12.00)	<0.0001	-2.07 (-6.26, 2.31)	0.3493

Models adjusted for patient characteristics (age, sex, Deyo-Charlson comorbidities) and healthcare characteristics (procedure type, year of surgery and hospital TJA volume).