

Supplemental Digital Content 5: Univariate/Bivariate Associations with Component Postoperative Pulmonary Complications

Characteristic	Pneumonia			Prolonged Ventilation >24 Hours			Reintubation			PaO ₂ /FiO ₂ <100 mmHg †		
	No N = 4573 (97.4%) n (%) or mean(SD)/ median [interquartile range]	Yes N = 121 (2.6%) n (%) or mean(SD)/ median [interquartile range]	p-value	No N = 4390 (93.6%) n (%) or mean(SD)/ median [interquartile range]	Yes N = 302 (6.4%) n (%) or mean(SD)/ median [interquartile range]	p-value	No N = 4243 (97.4%) n (%) or mean(SD)/ median [interquartile range]	Yes N = 115 (2.6%) n (%) or mean(SD)/ median [interquartile range]	p-value	No N = 4111 (96.2%) n (%) or mean(SD)/ median [interquartile range]	Yes N = 164 (3.8%) n (%) or mean(SD)/ median [interquartile range]	p-value
Preoperative Characteristics												
Age	62 (14)	64 (14)	0.0410	62 (14)	65 (13)	0.0003	62 (14)	68 (11)	<.0001	62 (14)	62 (13)	0.7594
Sex, Male	2964 (64.8)	60 (49.6)	0.0006	2862 (65.2)	161 (53.3)	<.0001	2736 (64.5)	65 (56.5)	0.0788	2643 (64.3)	104 (63.4)	0.8184
Race, non-white	493 (10.8)	22 (18.2)	0.0103	465 (10.6)	50 (16.6)	0.0014	448 (10.6)	15 (13.0)	0.3961	430 (10.5)	21 (12.8)	0.3406
Height, cm	171 (11)	167 (11)	<.0001	171 (11)	168 (11)	<.0001	171 (11)	168 (11)	0.0006	171 (11)	171 (11)	0.4674
Actual Body Weight, kg	87.0 (20.9)	81.9 (23.5)	0.0085	87.1 (20.9)	84.7 (21.9)	0.0577	87.1 (20.8)	80.6 (23.6)	0.0039	86.7 (20.8)	92.9 (24.4)	0.0017
Predicted Body Weight, kg	65.9 (11.1)	61.6 (11.8)	<.0001	66.1 (11.1)	62.3 (11.8)	<.0001	65.9 (11.1)	62.4 (11.6)	0.0010	65.8 (11.1)	65.2 (11.5)	0.5050
Body mass index, kg/m ²			0.2003			0.0019			0.0208			0.0007
Underweight (<18.5)	48 (1.2)	4 (3.3)		51 (1.2)	1 (0.3)		45 (1.1)	4 (3.5)		43 (1.1)	2 (1.2)	
Normal weight (18.5-24.9)	1058 (23.1)	32 (26.5)		1011 (23.0)	78 (25.8)		958 (22.6)	35 (30.4)		959 (23.3)	24 (14.6)	
Overweight (25-29.9)	1686 (36.9)	38 (31.4)		1624 (37.0)	100 (33.1)		1568 (37.0)	38 (33.0)		1516 (36.9)	55 (33.5)	
Class I Obesity (30-34.9)	1038 (22.7)	27 (22.3)		1008 (23.0)	57 (18.9)		975 (23.0)	22 (19.1)		937 (22.8)	38 (23.2)	
Class II Obesity (35-39.9)	435 (9.5)	13 (10.7)		417 (9.5)	30 (9.9)		409 (9.6)	13 (11.3)		388 (9.4)	22 (13.4)	
Class III Obesity (≥40)	308 (6.7)	7 (5.8)		279 (6.4)	36 (11.9)		288 (6.8)	3 (2.6)		268 (6.5)	23 (14.0)	
Current Smoker	612 (13.4)	18 (14.9)	0.6344	580 (13.2)	49 (16.2)	0.1371	426 (10.0)	16 (13.9)	0.1746	473 (11.5)	19 (11.6)	0.9750
Chronic Lung Disease *	518 (11.3)	25 (20.7)	0.0015	480 (10.9)	63 (20.9)	<.0001	508 (12.0)	22 (19.1)	0.0205	473 (11.5)	33 (20.1)	0.0008
Recent Pneumonia within one month	50 (1.1)	5 (4.1)	0.0022	50 (1.1)	5 (1.7)	0.4002	50 (1.2)	2 (1.7)	0.4010	47 (1.1)	4 (2.4)	0.1303
Sleep Apnea	475 (10.4)	15 (12.4)	0.4755	461 (10.5)	29 (9.6)	0.6214	473 (11.2)	17 (14.8)	0.2234	427 (10.4)	13 (7.9)	0.3093
Pulmonary Hypertension	1407 (30.8)	40 (33.1)	0.5902	1353 (30.8)	94 (31.1)	0.9114	1411 (33.3)	33(28.7)	0.3054	1279 (31.1)	47 (28.7)	0.5054
Moderate (PA systolic pressure 31-55 mmHg)	1162 (25.5)	23 (19.2)		1129 (25.8)	56 (18.7)		1162 (27.5)	21 (18.8)		1057 (25.8)	28 (17.4)	
Severe (PA systolic pressure >55 mmHg)	245 (5.4)	17 (14.2)		224 (5.1)	38 (12.7)		249 (5.9)	12 (10.7)		222 (5.4)	19 (11.8)	
New York Heart Association Class			0.0016			<.0001			0.0001			0.0001
I	3723 (82.3)	84 (70.0)		3602 (82.9)	204 (68.2)		3437 (81.0)	79 (70.5)		3315 (81.0)	115 (70.1)	
II	296 (6.5)	9 (7.5)		292 (6.7)	13 (4.4)		299 (7.1)	6 (5.4)		286 (7.0)	13 (7.9)	
III	388 (8.6)	21 (17.5)		350 (8.1)	59 (19.7)		392 (9.2)	17 (15.2)		379 (9.3)	23 (14.0)	
IV	119 (2.6)	6 (5.0)		102 (2.4)	23 (7.7)		115 (2.7)	10 (8.9)		111 (2.7)	13 (7.9)	
Recent Myocardial Infarction < 21 days	317 (6.9)	12 (9.9)	0.2042	289 (6.6)	40 (13.3)	<.0001	281 (6.6)	14 (12.2)	0.0194	291 (7.1)	14 (8.5)	0.4769
Preoperative Left Ventricular Ejection Fraction, %	60 [55, 65]	60 [50, 65]	0.0672	60 [55, 65]	60 [50, 65]	0.0001	60 [55, 65]	60 [50, 65]	0.1511	60 [55, 65]	60.0 [50, 65]	0.1511
Poor Mobility **	2274 (49.7)	79 (65.3)	0.0007	2153 (49.0)	198 (65.6)	<.0001	2099 (49.5)	83 (72.2)	<.0001	2039 (49.6)	105 (64.0)	0.0003
Extracardiac Arteriopathy	896 (19.6)	35 (28.9)	0.0111	845 (19.3)	85 (28.2)	0.0002	838 (19.8)	33 (28.7)	0.0179	781 (19.0)	45 (27.4)	0.0073
Peripheral Arterial Disease	319 (7.0)	14 (11.6)	0.0520	294 (6.7)	38 (12.6)	0.0001	293 (6.9)	16 (13.9)	0.0039	277 (6.7)	18 (11.0)	0.0358
Carotid Disease	579 (12.7)	23 (19.0)	0.0393	554 (12.6)	48 (15.9)	0.0998	551 (13.0)	24 (20.9)	0.0137	512 (12.5)	24 (14.6)	0.4084
Amputation for Arterial Disease	65 (1.4)	4 (3.3)	0.1013	61 (1.4)	8 (2.7)	0.0833	56 (1.3)	4 (3.5)	0.0726	57 (1.4)	6 (3.7)	0.0325
Previous Major Vascular Surgical Intervention	215 (4.7)	9 (7.4)	0.1634	198 (4.5)	25 (8.3)	0.0029	203 (4.8)	4 (3.5)	0.5159	188 (4.6)	15 (9.2)	0.0069
Dyslipidemia	2631 (57.5)	72 (59.5)	0.6650	2539 (57.8)	164 (54.3)	0.2297	2637 (62.2)	66 (57.4)	0.2996	2432 (59.2)	99 (60.4)	0.7577
Arrhythmia ***	712 (15.6)	23 (19.0)	0.3043	671 (15.3)	64 (21.2)	0.0063	668 (15.7)	27 (23.5)	0.0254	653 (15.9)	34 (20.7)	0.0974
Renal Impairment												
Creatinine Clearance, mL/min/1.73 m ² ****	77.0 (24.2)	59.8 (29.0)	<.0001	77.4 (24.1)	63.9 (27.3)	<.0001	77.3 (24.3)	58.0 (24.6)	<.0001	77.0 (24.3)	67.3 (27.2)	<.0001
Dialysis Requirement	98 (2.1)	6 (5.0)	0.0508	81 (1.9)	23 (7.6)	<.0001	93 (2.2)	4 (3.5)	0.3253	86 (2.1)	8 (4.9)	0.0267
Diabetes treated with Insulin	354 (7.7)	20 (16.5)	0.0004	335 (7.6)	38 (12.6)	0.0021	327 (7.7)	21 (18.3)	<.0001	319 (7.8)	15 (9.2)	0.5164
Liver Disease	74 (1.6)	3 (2.5)	0.4507	74 (1.7)	3 (1.0)	0.4846	73 (1.7)	4 (3.5)	0.1446	71 (1.7)	3 (1.8)	0.7613
Cancer	221 (4.8)	4 (3.3)	0.4377	215 (4.9)	10 (3.3)	0.2121	223 (5.3)	2 (1.7)	0.0926	198 (4.8)	8 (4.9)	0.9711
Active Endocarditis	229 (5.0)	9 (7.4)	0.2291	216 (4.9)	22 (7.3)	0.0701	215 (5.1)	10 (8.7)	0.0827	202 (4.9)	15 (9.2)	0.0155

Critical Preoperative State	379 (8.3)	31 (25.6)	<.0001	323 (7.4)	87 (28.8)	<.0001	388 (9.1)	19 (16.5)	0.0073	360 (8.8)	38 (23.2)	<.0001
Preoperative Ventilation (exclusion)	(exclusion)	(exclusion)		(exclusion)	(exclusion)		(exclusion)	(exclusion)		(exclusion)	(exclusion)	
Preoperative Inotropic Support	336 (7.4)	30 (24.8)	<.0001	288 (6.6)	78 (25.8)	<.0001	350 (8.3)	16 (13.9)	0.0307	322 (7.8)	36 (22.0)	<.0001
Cardiogenic Shock	22 (0.5)	2 (1.7)	0.1260	18 (0.4)	6 (2.0)	0.0002	23 (0.5)	1 (0.9)	0.4746	23 (0.6)	1 (0.6)	0.6099
Intra-aortic balloon pump	53 (1.2)	5 (4.1)	0.0162	36 (0.8)	22 (7.3)	<.0001	51 (1.2)	4 (3.5)	0.0560	50 (1.2)	4 (2.4)	0.1514
Hemoglobin, g/dL	13.5 (1.9)	12.4 (2.3)	<.0001	13.5 (1.9)	12.4 (2.2)	<.0001	13.5 (1.9)	12.3 (2.2)	<.0001	13.5 (1.9)	12.8 (2.2)	<.0001
Platelet Count, K/uL	224 (69)	232 (95)	0.3822	225 (69)	224 (77)	0.8878	223 (68)	225 (82)	0.7936	223 (68)	228 (78)	0.4011
White Blood Cell Count, K/uL	6.8 [5.7, 8.3]	8.1 [6.2, 9.2]	<.0001	6.8 [5.7, 8.2]	7.5 [6.1, 9.1]	<.0001	6.8 [5.7, 8.3]	7.4 [5.7, 8.8]	0.0885	6.8 [5.7, 8.2]	7.9 [6.3, 9.5]	0.0885
International Normalized Ratio	1.0 [1.0, 1.1]	1.0 [1.0, 1.1]	0.1485	1.0 [1.0, 1.0]	1.0 [1.0, 1.1]	<.0001	1.0 [1.0, 1.1]	1.0 [1.0, 1.1]	0.0016	1.0 [1.0, 1.1]	1.0 [1.0, 1.1]	0.0016
Preoperative SpO ₂ , %	97 [96, 98]	97 [95, 98]	0.0094	97 [96, 98]	97 [95, 98]	0.0018	97 [96, 98]	97 [95, 98]	0.0959	97 [96, 98]	96 [95, 97]	0.0959
Preoperative Respiratory Rate	16 [16, 18]	16 [16, 18]	0.1370	16 [16, 18]	16 [16, 18]	0.1941	16 [16, 18]	16 [16, 18]	0.0454	16 [16, 18]	16 [16, 18]	0.0454
Acuity			0.0002			<.0001			<.0001			0.0002
Elective	3660 (80.0)	80 (66.1)		3563 (81.2)	176 (58.3)		3437 (81.0)	73 (63.5)		3279 (79.8)	111 (67.7)	
Urgent	913 (20.0)	41 (33.9)		827 (18.8)	126 (41.7)		806 (19.0)	42 (36.5)		832 (20.2)	53 (32.3)	
Surgical Procedure Type			<.0001			<.0001			0.0010			0.0013
Aortic Valve + Aortic Valve + CABG	99 (2.2)	1 (0.8)		86 (2.0)	14 (4.6)		92 (2.2)	2 (1.7)		90 (2.2)	2 (1.2)	
Isolated CABG	902 (19.7)	25 (20.7)		858 (19.5)	69 (22.9)		827 (19.5)	23 (20.0)		796 (19.4)	44 (26.8)	
Isolated Valve	79 (1.7)	5 (4.1)		66 (1.5)	18 (6.0)		72 (1.7)	4 (3.5)		72 (1.8)	2 (1.2)	
Valve + CABG	948 (20.7)	21 (17.4)		929 (21.2)	40 (13.3)		843 (19.9)	16 (13.9)		844 (20.5)	23 (14.0)	
Valve + CABG	2038 (44.6)	40 (33.1)		1983 (45.2)	95 (31.5)		1934 (45.6)	43 (37.4)		1844 (44.9)	61 (37.2)	
Valve + CABG	507 (11.1)	29 (24.0)		468 (10.7)	66 (21.9)		475 (11.2)	27 (23.5)		465 (11.3)	32 (19.5)	
Admission Type			0.0065			<.0001			0.0001			<.0001
Admit Inpatient	3411 (74.6)	77 (63.6)		3337 (76.0)	149 (49.3)		3206 (75.6)	69 (60.0)		3061 (74.5)	99 (60.4)	
Inpatient	1162 (25.4)	44 (36.4)		1053 (24.0)	153 (50.7)		1037 (24.4)	46(40.0)		1050 (25.5)	65 (39.6)	
Date of surgery by STS Version			0.0165			0.0020			0.0462			<.0001
2.52 (Jan 2006-Dec 2007)	338 (7.4)	11 (9.1)		330 (7.5)	19 (6.3)		344 (8.1)	5 (4.4)		331 (8.1)	8 (4.9)	
2.61 (Jan 2008-June 2011)	1240 (27.1)	46 (38.0)		1186 (27.0)	100 (33.1)		1249 (29.4)	37 (32.2)		1200 (29.2)	81 (49.4)	
2.73 (July 2011-June 2014)	1638 (35.8)	41 (33.9)		1556 (35.4)	121 (40.1)		1297 (30.6)	46 (40.0)		1422 (34.6)	58 (35.4)	
2.81 (July 2014-May 2017)	1357 (26.7)	23 (19.0)		1318 (30.0)	62 (20.5)		1353 (31.9)	27 (23.5)		1158 (28.2)	17 (10.4)	
ASA Physical Status			0.1104			<.0001			0.0365			0.0105
3	1446 (31.6)	30(24.8)		1428 (32.5)	48 (15.9)		1349 (31.8)	26 (22.6)		1317 (32.0)	37 (22.6)	
4	3127 (68.4)	91 (75.2)		2962 (67.5)	254 (84.1)		2894 (68.2)	89 (77.4)		2794 (68.0)	127 (77.4)	
Intraoperative Characteristics												
Perfusion Time, hours	2.2 (1.0)	2.9 (1.4)	<.0001	2.2 (1.0)	3.1 (1.4)	<.0001	2.2 (1.0)	2.6 (1.3)	0.0017	2.2 (1.0)	2.8 (1.3)	<.0001
Aortic Crossclamp Time, hours	1.7 (0.8)	2.3 (1.2)	<.0001	1.7 (0.8)	2.4 (1.1)	<.0001	1.7 (0.8)	2.0 (1.0)	0.0028	1.7 (0.8)	2.2 (1.1)	<.0001
Anesthesia Duration, hours	6.5 [5.4, 7.8]	7.8 [6.3, 9.7]	<.0001	6.5 [5.4, 7.8]	8.1 [6.9, 10.0]	<.0001	6.5 [5.4, 7.9]	7.5 [5.7, 9.5]	<.0001	6.5 [5.4, 7.8]	7.6 [6.3, 9.3]	<.0001
Anesthesia Provider *****			0.7978			0.8249			0.8211			0.1444
Low LPV User	2422 (53.0)	67 (55.4)		2328 (53.0)	159 (52.7)		2175 (51.3)	62 (53.9)		2135 (51.9)	98 (59.8)	
Medium LPV User	1800 (36.4)	44 (36.4)		1727 (39.3)	117 (38.7)		1725 (40.7)	45 (39.1)		1671 (40.7)	56 (34.2)	
High LPV User	351 (7.7)	10 (8.3)		335 (7.6)	26 (8.6)		343 (8.1)	8 (7.0)		305 (7.4)	10 (6.1)	
Intraoperative Albuterol	55 (1.2)	2 (1.7)	0.6585	51 (1.2)	6 (2.0)	0.1799	53 (1.3)	0 (0)	0.4035	49 (1.2)	5 (3.1)	0.0545
Intraoperative Diuretic *****	2829 (61.9)	69 (57.0)	0.2798	2710 (61.7)	188 (62.3)	0.8571	2809 (66.2)	71 (61.7)	0.3184	2588 (63.0)	95 (57.9)	0.1917
Intraoperative Vasopressor infusion (phenylephrine, norepinephrine, vasopressin)	4183 (91.5)	111 (91.7)	0.9183	4007 (91.3)	285 (94.4)	0.0624	4041(95.2)	106 (92.2)	0.1308	3840 (93.4)	156 (95.1)	0.3835
Intraoperative Inotrope infusion (epinephrine, dobutamine, milrinone, isoproterenol, dopamine)	1645 (36.0)	78 (64.5)	<.0001	1508 (34.4)	213 (70.5)	<.0001	1499 (35.3)	75 (65.2)	<.0001	1464 (35.6)	95 (57.9)	<.0001
Total intraoperative opioid, oral morphine equivalents	300 [270, 360]	300 [225, 375]	0.1755	300 [270, 360]	300 [240, 375]	0.0276	300 [270, 360]	300 [240, 330]	0.0155	300 [270, 375]	300 [225, 375]	0.0155
Total intraoperative crystalloid, L	3.0 [2.0, 4.2]	3.5 [2.5, 5.9]	0.0001	3.0 [2.0, 4.2]	3.5 [2.3, 5.5]	<.0001	3.0 [2.1, 4.4]	3.1 [2.0, 5.0]	0.2817	3.0 [2.1, 4.3]	3.4 [2.3, 5.5]	0.2817
Total intraoperative colloid, L	0 [0, 0.5]	0 [0, 0.5]	0.3119	0 [0, 0.5]	0 [0, 0.5]	0.3773	0 [0, 0.5]	0 [0, 0.5]	0.0494	0 [0, 0.5]	0 [0, 0.2]	0.0494
Intraoperative packed red blood cells, units	0 [0, 2]	2 [0, 5]	<.0001	0 [0, 2]	2 [0, 5]	<.0001	0 [0, 2]	2 [0, 5]	<.0001	0 [0, 2]	2 [0, 5]	<.0001
Intraoperative red blood cell salvage, L	0 [0, 0]	0 [0, 0]	0.9841	0 [0, 0]	0 [0, 0]	0.4868	0 [0, 0]	0 [0, 0]	0.9444	0 [0, 0]	0 [0, 0]	0.9444
Fresh frozen plasma, units	0 [0, 0]	0 [0, 3]	<.0001	0 [0, 0]	0 [0, 3]	<.0001	0 [0, 0]	0 [0, 3]	<.0001	0 [0, 0]	0 [0, 2]	<.0001
Platelets, units	0 [0, 0]	1 [0, 3]	<.0001	0 [0, 0]	1 [0, 3]	<.0001	0 [0, 0]	0 [0, 3]	<.0001	0 [0, 0]	0 [0, 2]	<.0001
Cryoprecipitate, units	0 [0, 0]	0 [0, 0]	<.0001	0 [0, 0]	0 [0, 0]	<.0001	0 [0, 0]	0 [0, 0]	<.0001	0 [0, 0]	0 [0, 0]	<.0001
Total urine output, L	1.9 (1.2)	1.9 (1.3)	0.5828	1.9 (1.1)	1.9 (1.4)	0.7522	1.9 (1.2)	1.7 (1.2)	0.0143	1.9 (1.1)	1.9 (1.5)	0.9784

Pre-CPB Ventilator / Respiratory Parameters												
Tidal volume, mL/kg predicted body weight	7.8 (1.5)	8.2 (1.5)	0.0082	7.8 (1.5)	8.1 (1.9)	0.0015	7.8 (1.5)	8.0 (1.4)	0.1914	7.8 (1.5)	8.1 (1.4)	0.0080
Peak Inspiratory Pressure, cm H ₂ O	17 [15, 20]	20 [16, 22]	<.0001	17 [15, 20]	19 [17, 22]	<.0001	17 [15, 19]	18 [16, 22]	0.0005	17 [15, 20]	19 [16, 22]	0.0005
Positive End-Expiratory Pressure, cm H ₂ O	5 [4, 5]	5 [2, 5]	0.4499	5 [4, 5]	5 [2, 5]	0.2599	5 [4, 5]	5 [2, 5]	0.2067	5 [4, 5]	5 [4, 5]	0.2067
Driving Pressure, cm H ₂ O	13 [11, 16]	16 [13, 19]	<.0001	13 [11, 16]	16 [13, 19]	<.0001	13 [10.9, 15.9]	15 [12, 17.8]	<.0001	13.0 [11.0, 16.0]	15.0 [13.0, 18.0]	<.0001
SpO ₂ , %	99 [98, 100]	100 [99, 100]	0.0018	99 [98, 100]	100 [99, 100]	<.0001	99 [98, 100]	100 [99, 100]	0.0002	99.0 [98, 100]	99 [98, 100]	0.0002
Inspired FiO ₂ , %	97 [96, 98]	97 [96, 98]	0.4710	97 [96, 98]	97 [96, 98]	0.0008	97 [96, 98]	97 [96, 98]	0.7473	97 [96, 98]	97 [96, 98]	0.7473
Pre-CPB Ventilator / Respiratory Parameters												
Tidal volume, mL/kg predicted body weight	7.8 (1.5)	8.1 (1.4)	0.0146	7.7 (1.4)	8.2 (1.8)	<.0001	7.7 (1.4)	7.9 (1.2)	0.1012	7.8 (1.4)	8.2 (1.4)	<.0001
Peak Inspiratory Pressure, cm H ₂ O	17 [15, 20]	21 [17, 24]	<.0001	17 [15, 20]	21 [17, 24]	<.0001	17 [15, 20]	19 [17, 22]	<.0001	17 [15, 20]	20 [17, 24]	<.0001
Positive End-Expiratory Pressure, cm H ₂ O	5 [4, 5]	5 [4, 5]	0.5787	5 [4, 5]	5 [4, 5]	0.7263	5 [4, 5]	5 [4, 5]	0.1899	5 [4, 5]	5 [4, 6]	0.1899
Driving Pressure, cm H ₂ O	13 [11, 16]	16 [13, 20]	<.0001	13 [11, 16]	16 [13, 20]	<.0001	13 [11, 15]	15 [12, 18]	<.0001	13 [11, 16]	16 [13, 18]	<.0001
SpO ₂ , %	100 [99, 100]	100 [99, 100]	0.4530	100 [99, 100]	100 [98, 100]	0.0625	100 [99, 100]	100 [99, 100]	0.8669	100 [99, 100]	99 [98, 100]	0.8669
Inspired FiO ₂ , %	97 [96, 98]	97 [95, 98]	0.0663	97 [96, 98]	97 [95, 98]	0.0602	97 [96, 98]	97 [96, 98]	0.0625	97 [96, 98]	97 [96, 98]	0.0625

ASA = American Society of Anesthesiologists; CABG = coronary artery bypass graft; CPB= cardiopulmonary bypass; FiO₂ = fraction of inspired oxygen; LPV = lung-protective ventilation; PA = pulmonary artery; STS = Society of Thoracic Surgeons

† Within 48 hours postoperatively while intubated

* Defined by chronic lung disease ≥ moderate or bronchodilator therapy within STS; or chronic obstructive pulmonary disease ≥ moderate on preoperative anesthesia history & physical

** Defined by functional capacity – Low (≤4 metabolic equivalents of task) on preoperative anesthesia history & physical

*** Defined via STS as a history of any of the following: atrial fibrillation, atrial flutter, 3rd degree heart block, ventricular fibrillation, ventricular tachycardia

**** Calculated using the Chronic Kidney Disease – Epidemiology Collaboration equation

***** Defined as the frequency of primary anesthesiology attending using a bundled LPV strategy, as a proportion of all cardiac cases performed by the anesthesiology attending among the study population, transformed into tertiles.

***** Defined as intraoperative administration of furosemide, bumetanide, or mannitol

P-value from independent t-Test, Mann-Whitney U Test, Chi-Square Test or Fisher's Exact Test, as appropriate.