Univariate Analysis for the VQI FBVAR Dataset

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p-value

We use Welch's Two Sample t-test for continuous variables and Pearson's Chi-squared Test for categorical variables.

Descriptive statistics tables

population of interest

	Overall
	(N=3757)
Presentation	
Asymptomatic	3315 (88.2%)
Symptomatic	442 (11.8%)

Patient demographic and co-morbidities

Table: A comparison of the baseline demographic and co-morbidities characteristics for symptomatic versus asymptomatic patients who undergo the F-BEVAR procedure

	Asymptomatic	Symptomatic	P-value
	(N=3315)	(N=442)	
Age			
Mean (SD)	73.5 (7.89)	70.8 (10.1)	<0.001
Median [Min, Max]	74.0 [0, 90.0]	72.0 [33.0, 90.0]	
Age categories			
<50	19 (0.6%)	14 (3.2%)	<0.001
>79	749 (22.6%)	87 (19.7%)	
50-59	106 (3.2%)	45 (10.2%)	
60-69	856 (25.8%)	115 (26.0%)	
70-79	1585 (47.8%)	181 (41.0%)	
Gender			
female	800 (24.1%)	177 (40.0%)	<0.001
male	2515 (75.9%)	265 (60.0%)	
Ethnicity			
Hispanic or Latino	114 (3.4%)	17 (3.8%)	0.767
None Hispanic or Latino	3190 (96.2%)	424 (95.9%)	
Missing	11 (0.3%)	1 (0.2%)	
Race			
American Indian or Alaskan Native	8 (0.2%)	1 (0.2%)	<0.001
Asian	68 (2.1%)	10 (2.3%)	
Black or African American	221 (6.7%)	62 (14.0%)	
More than 1 race	5 (0.2%)	1 (0.2%)	

	Asymptomatic	Symptomatic	P-value
Native Hawaiian or other Pacific Islander	2 (0.1%)	1 (0.2%)	
Unknown/Other	227 (6.8%)	53 (12.0%)	
White	2784 (84.0%)	314 (71.0%)	
Transfer			
Hospital	51 (1.5%)	215 (48.6%)	<0.001
No	3262 (98.4%)	226 (51.1%)	
Rehab Unit	2 (0.1%)	1 (0.2%)	
Primary Insurer			
Commercial	792 (23.9%)	111 (25.1%)	<0.001
Medicaid	70 (2.1%)	31 (7.0%)	
Medicare	1754 (52.9%)	208 (47.1%)	
Military/VA	131 (4.0%)	13 (2.9%)	
Non US Insurance	191 (5.8%)	10 (2.3%)	
Self Pay	14 (0.4%)	12 (2.7%)	
Missing	363 (11.0%)	57 (12.9%)	
Living Status			
Home	3289 (99.2%)	435 (98.4%)	0.232
Homeless	3 (0.1%)	1 (0.2%)	
Nursing home	23 (0.7%)	6 (1.4%)	
Functional Status			
Assisted care	53 (1.6%)	22 (5.0%)	<0.001
Bed bound	5 (0.2%)	1 (0.2%)	
Full	2042 (61.6%)	246 (55.7%)	
Light work	831 (25.1%)	117 (26.5%)	
Self care	382 (11.5%)	55 (12.4%)	
Missing	2 (0.1%)	1 (0.2%)	
Cerebrovascular Disease History			
No	2946 (88.9%)	376 (85.1%)	0.023
Yes	369 (11.1%)	66 (14.9%)	
Coronary Artery Disease History			
No	2366 (71.4%)	298 (67.4%)	0.111
Yes	949 (28.6%)	143 (32.4%)	
Missing	0 (0%)	1 (0.2%)	
Congestive Heart Failure History			
No	2806 (84.6%)	358 (81.0%)	0.056
Yes	509 (15.4%)	84 (19.0%)	
Chronic Obstructive Pulmonary Disorder History			
No	1952 (58.9%)	247 (55.9%)	0.249
Yes	1363 (41.1%)	195 (44.1%)	
Diabetes History			
No	2692 (81.2%)	356 (80.5%)	0.787
Yes	623 (18.8%)	86 (19.5%)	
Dialysis Status			
No	3256 (98.2%)	424 (95.9%)	0.003
Yes	59 (1.8%)	18 (4.1%)	
Hypertension History			
No	330 (10.0%)	34 (7.7%)	0.162
Yes	2978 (89.8%)	405 (91.6%)	
Missing	7 (0.2%)	3 (0.7%)	
Smoking Status			
No	359 (10.8%)	63 (14.3%)	0.038
Yes	2956 (89.2%)	378 (85.5%)	

	Asymptomatic	Symptomatic	P-value
Missing	0 (0%)	1 (0.2%)	
History of Coronary Artery Bypass Surgery			
No	2721 (82.1%)	367 (83.0%)	0.69
Yes	592 (17.9%)	75 (17.0%)	
Missing	2 (0.1%)	0 (0%)	
History of Percutaneous Coronary Intervention			
No	2548 (76.9%)	352 (79.6%)	0.194
Yes	764 (23.0%)	89 (20.1%)	
Missing	3 (0.1%)	1 (0.2%)	
Aneurysm Repair History			
No	2549 (76.9%)	292 (66.1%)	<0.001
Yes	766 (23.1%)	150 (33.9%)	
Stress Test			
No	1717 (51.8%)	341 (77.1%)	<0.001
Yes	1595 (48.1%)	101 (22.9%)	
Missing	3 (0.1%)	0 (0%)	
Creatinine			
Mean (SD)	1.17 (0.612)	1.16 (0.686)	0.756
Median [Min, Max]	1.07 [0, 14.4]	1.00 [0.340, 7.50]	
Missing	74 (2.2%)	16 (3.6%)	
Glomerular Filtration Rate			
End-stage renal disease	14 (0.4%)	7 (1.6%)	<0.001
Mildly decreased	1497 (45.2%)	168 (38.0%)	
Mildly to severely decreased	952 (28.7%)	122 (27.6%)	
Normal or increased	559 (16.9%)	106 (24.0%)	
Severely decreased	89 (2.7%)	13 (2.9%)	
Missing	204 (6.2%)	26 (5.9%)	
Discharge ASA			
No	456 (13.8%)	53 (12.0%)	0.489
Yes	2772 (83.6%)	363 (82.1%)	
Missing	87 (2.6%)	26 (5.9%)	
Discharge P2Y12 Antagonist			
No	1382 (41.7%)	217 (49.1%)	<0.001
Yes	1845 (55.7%)	199 (45.0%)	
Missing	88 (2.7%)	26 (5.9%)	
Discharge Statin			
No	536 (16.2%)	62 (14.0%)	0.417
Yes	2692 (81.2%)	354 (80.1%)	
Missing	87 (2.6%)	26 (5.9%)	

Operative Variables

Table: A comparison of the operative characteristics for symptomatic versus asymptomatic patients who undergo the F-BEVAR procedure

	Asymptomatic	Symptomatic	P-value
	(N=3315)	(N=442)	
Prior Aortic Surgery			
Both	91 (2.7%)	16 (3.6%)	<0.001
Endo	407 (12.3%)	95 (21.5%)	
None	2563 (77.3%)	281 (63.6%)	
Open	254 (7.7%)	50 (11.3%)	

	Asymptomatic	Symptomatic	P-value
Pathology			
Aneurysm	3176 (95.8%)	358 (81.0%)	<0.001
Aneurysm from dissection	79 (2.4%)	30 (6.8%)	
Dissection	38 (1.1%)	37 (8.4%)	
PAU/IMH	22 (0.7%)	17 (3.8%)	
Maximum Aortic Diameter			
Mean (SD)	61.2 (10.5)	65.9 (18.2)	<0.001
Median [Min, Max]	60.0 [5.00, 130]	63.0 [5.50, 190]	
Missing	17 (0.5%)	7 (1.6%)	
Urgency			
Elective	3281 (99.0%)	246 (55.7%)	<0.001
Emergent	2 (0.1%)	32 (7.2%)	
Urgent	32 (1.0%)	164 (37.1%)	
Aneurysm Type			
Anastomotic	37 (1.1%)	8 (1.8%)	<0.001
Degenerative, fusiform	2753 (83.0%)	297 (67.2%)	
Degenerative, saccular	290 (8.7%)	38 (8.6%)	
Intercostal or visceral patch	14 (0.4%)	1 (0.2%)	
Prior trauma	0 (0%)	2 (0.5%)	
Missing	221 (6.7%)	96 (21.7%)	
Dissection Type			
Acute, <= 30 days	5 (0.2%)	34 (7.7%)	<0.001
Chronic, >30 days	112 (3.4%)	33 (7.5%)	
Missing	3198 (96.5%)	375 (84.8%)	
Genetic History			
Ehlers-Danlos	1 (0.0%)	1 (0.2%)	0.525
Loeys-Dietz	1 (0.0%)	0 (0%)	
Marfans	12 (0.4%)	2 (0.5%)	
Non-specific	86 (2.6%)	10 (2.3%)	
None	3212 (96.9%)	429 (97.1%)	
Missing	3 (0.1%)	0 (0%)	
Proximal Zone of Disease			
Mean (SD)	6.74 (1.62)	5.56 (1.97)	<0.001
Median [Min, Max]	7.00 [2.00, 9.00]	5.00 [2.00, 9.00]	
Distal Zone of Disease			
10B	716 (21.6%)	91 (20.6%)	<0.001
10L	129 (3.9%)	14 (3.2%)	
10R	193 (5.8%)	19 (4.3%)	
11B	64 (1.9%)	10 (2.3%)	
11L	37 (1.1%)	8 (1.8%)	
11R	39 (1.2%)	11 (2.5%)	
4	1 (0.0%)	1 (0.2%)	
5	21 (0.6%)	4 (0.9%)	
6	24 (0.7%)	12 (2.7%)	
7	25 (0.8%)	18 (4.1%)	
8	158 (4.8%)	30 (6.8%)	
9	1908 (57.6%)	224 (50.7%)	
Type of TAAA			
Juxtarenal AAA	1347 (40.6%)	94 (21.3%)	<0.001
Type 1 TAAA	9 (0.3%)	4 (0.9%)	
Type 2 TAAA	137 (4.1%)	69 (15.6%)	
Type 3 TAAA	534 (16.1%)	118 (26.7%)	

	Asymptomatic	Symptomatic	P-value
Type 4 TAAA	1049 (31.6%)	110 (24.9%)	
Type 5 TAAA	51 (1.5%)	15 (3.4%)	
Missing	188 (5.7%)	32 (7.2%)	
Anesthesia			
General	3279 (98.9%)	434 (98.2%)	0.239
Local	21 (0.6%)	6 (1.4%)	
Regional	15 (0.5%)	2 (0.5%)	
Iodinated Contrast			
Mean (SD)	127 (70.4)	128 (79.9)	0.674
Median [Min, Max]	115 [0, 677]	114 [0, 501]	
Missing	74 (2.2%)	11 (2.5%)	
Estimated Blood Loss			
Mean (SD)	417 (695)	405 (443)	0.635
Median [Min, Max]	250 [0, 25000]	250 [0, 3000]	
Missing	34 (1.0%)	7 (1.6%)	
Fluoroscopy Time			
Mean (SD)	73.9 (38.8)	71.6 (44.1)	0.316
Median [Min, Max]	66.0 [1.00, 320]	64.0 [6.80, 285]	
Missing	169 (5.1%)	26 (5.9%)	
Packed Red Blood Cells given in OR or Preop			
Mean (SD)	0.594 (3.92)	1.03 (1.97)	<0.001
Median [Min, Max]	0 [0, 200]	0 [0, 16.0]	
Missing	3 (0.1%)	2 (0.5%)	
Total Procedure Time			
Mean (SD)	252 (111)	267 (129)	0.022
Median [Min, Max]	231 [25.0, 911]	239 [52.0, 852]	
Missing	3 (0.1%)	1 (0.2%)	
Intravascular ultrasound (IVUS) or Transesophageal Echo (TEE)			
Both	30 (0.9%)	7 (1.6%)	<0.001
IVUS	515 (15.5%)	130 (29.4%)	
No	2720 (82.1%)	293 (66.3%)	
TEE	34 (1.0%)	12 (2.7%)	
Missing	16 (0.5%)	0 (0%)	
Left or Right Access			
Open	1064 (32.1%)	148 (33.5%)	0.3
Percutaneous	1972 (59.5%)	243 (55.0%)	
Missing	279 (8.4%)	51 (11.5%)	
Arm/Neck Access			
No	2567 (77.4%)	282 (63.8%)	<0.001
Yes	748 (22.6%)	160 (36.2%)	
Number of Aortic Devices			
Mean (SD)	2.22 (0.898)	2.56 (1.24)	<0.001
Median [Min, Max]	2.00 [1.00, 6.00]	2.00 [1.00, 6.00]	
Custom/Modified Devices			
No	803 (24.2%)	100 (22.6%)	0.497
Yes	2512 (75.8%)	342 (77.4%)	
Graft Type			
Custom	1586 (47.8%)	93 (21.0%)	<0.001
Physician modified	839 (25.3%)	218 (49.3%)	
Standard	890 (26.8%)	131 (29.6%)	
Right Iliac Endpoint			

	Asymptomatic	Symptomatic	P-value
Common	1972 (59.5%)	183 (41.4%)	0.134
External, Unintended	20 (0.6%)	4 (0.9%)	
External,Intended	241 (7.3%)	33 (7.5%)	
None	24 (0.7%)	2 (0.5%)	
Missing	1058 (31.9%)	220 (49.8%)	
Left Iliac Endpoint			
Common	1985 (59.9%)	179 (40.5%)	0.064
External, Unintended	13 (0.4%)	4 (0.9%)	
External,Intended	197 (5.9%)	24 (5.4%)	
None	24 (0.7%)	1 (0.2%)	
Missing	1096 (33.1%)	234 (52.9%)	
Staged Branch Treatment			
No	3131 (94.4%)	404 (91.4%)	0.009
Yes	178 (5.4%)	38 (8.6%)	
Missing	6 (0.2%)	0 (0%)	
Left Subclavian Proximal Branch Treatment			
No	3251 (98.1%)	396 (89.6%)	<0.001
Yes	64 (1.9%)	46 (10.4%)	
Celiac Proximal Branch Treatment			
No	1453 (43.8%)	76 (17.2%)	<0.001
Yes	1862 (56.2%)	366 (82.8%)	
SMA Proximal Branch Treatment			
No	416 (12.5%)	26 (5.9%)	<0.001
Yes	2899 (87.5%)	416 (94.1%)	
Right Renal Poximal Branch Treatment			
No	23 (0.7%)	18 (4.1%)	<0.001
Yes	3292 (99.3%)	424 (95.9%)	
Left Renal Proximal Branch Treatment			
No	23 (0.7%)	18 (4.1%)	<0.001
Yes	3292 (99.3%)	424 (95.9%)	
Time to Extubation			
<12 hrs	151 (4.6%)	31 (7.0%)	<0.001
>24 hrs	75 (2.3%)	29 (6.6%)	
12-24 hrs	81 (2.4%)	23 (5.2%)	
In OR	2964 (89.4%)	348 (78.7%)	
Missing	44 (1.3%)	11 (2.5%)	
Spinal Drain Placement			
No	2743 (82.7%)	296 (67.0%)	<0.001
Yes	571 (17.2%)	146 (33.0%)	
Missing	1 (0.0%)	0 (0%)	
Treatment Left Renal			
None	307 (9.3%)	39 (8.8%)	<0.001
Occluded/Covered	101 (3.0%)	30 (6.8%)	
Scallop/Fen/Branch/Chimney	2876 (86.8%)	354 (80.1%)	
Missing	31 (0.9%)	19 (4.3%)	
Treatment Right Renal			
None	340 (10.3%)	64 (14.5%)	<0.001
Occluded/Covered	97 (2.9%)	28 (6.3%)	
Scallop/Fen/Branch/Chimney	2758 (83.2%)	319 (72.2%)	
Missing	120 (3.6%)	31 (7.0%)	
Treatment SMA			
None	241 (7.3%)	35 (7.9%)	0.879

	Asymptomatic	Symptomatic	P-value
Occluded/Covered	4 (0.1%)	1 (0.2%)	
Scallop/Fen/Branch/Chimney	2647 (79.8%)	379 (85.7%)	
Missing	423 (12.8%)	27 (6.1%)	
Treatment Celiac			
None	364 (11.0%)	58 (13.1%)	0.04
Occluded/Covered	92 (2.8%)	28 (6.3%)	
Scallop/Fen/Branch/Chimney	1400 (42.2%)	280 (63.3%)	
Missing	1459 (44.0%)	76 (17.2%)	
Treatment Left Subclavian			
None	15 (0.5%)	14 (3.2%)	0.221
Occluded/Covered	6 (0.2%)	12 (2.7%)	
Scallop/Fen/Branch/Chimney	10 (0.3%)	6 (1.4%)	
Missing	3284 (99.1%)	410 (92.8%)	
Number of Treated Branches			
1	352 (10.6%)	63 (14.3%)	<0.001
2	732 (22.1%)	82 (18.6%)	
3	1059 (31.9%)	83 (18.8%)	
4	1172 (35.4%)	214 (48.4%)	
Number of Treated Renals			
0	439 (13.2%)	88 (19.9%)	<0.001
1	118 (3.6%)	35 (7.9%)	
2	2758 (83.2%)	319 (72.2%)	
Number of Occluded Renals			
Yes	101 (3.0%)	30 (6.8%)	<0.001
No	3214 (97.0%)	412 (93.2%)	
SMA Proximal Branch Occluded			
Yes	4 (0.1%)	1 (0.2%)	1
No	3311 (99.9%)	441 (99.8%)	
Celiac Proximal Branch Occluded			
Yes	92 (2.8%)	28 (6.3%)	<0.001
No	3223 (97.2%)	414 (93.7%)	

Outcomes

Table 3: A comparison of the long term follow-up outcomes for symptomatic versus asymptomatic patients who undergo the F-BEVAR procedure

	Asymptomatic	Symptomatic	P-value
	(N=3315)	(N=442)	
Death			
Yes	390 (11.8%)	94 (21.3%)	<0.001
No	2925 (88.2%)	348 (78.7%)	
Survival Days			
Mean (SD)	713 (847)	590 (804)	0.003
Median [Min, Max]	398 [-96.0, 3850]	309 [0, 3750]	

Table 3: A comparison of the procedure outcomes for symptomatic versus asymptomatic patients who undergo the F-BEVAR procedure

	Asymptomatic	Symptomatic	P-value
	(N=3315)	(N=442)	
Length of stay in days between admission date and discharge date			
Mean (SD)	6.17 (19.5)	12.1 (26.4)	<0.001
Median [Min, Max]	3.00 [0, 374]	7.00 [1.00, 376]	
Missing	1 (0.0%)	0 (0%)	
Length of stay in days between surgery date and discharge date			
Mean (SD)	5.37 (16.8)	7.93 (8.44)	<0.001
Median [Min, Max]	3.00 [0, 372]	6.00 [0, 80.0]	
Missing	1 (0.0%)	0 (0%)	
Deployment Technical Success			
No	108 (3.3%)	17 (3.8%)	0.529
Yes	3035 (91.6%)	389 (88.0%)	
Missing	172 (5.2%)	36 (8.1%)	
Conversion to Open			
No	3301 (99.6%)	439 (99.3%)	0.706
Yes	14 (0.4%)	3 (0.7%)	
Endoleak at Completion of Procedure			
No	1073 (32.4%)	127 (28.7%)	1
Yes	2159 (65.1%)	257 (58.1%)	
Missing	83 (2.5%)	58 (13.1%)	
ICU Stay			
Mean (SD)	2.14 (4.19)	4.19 (5.49)	<0.001
Median [Min, Max]	1.00 [0, 85.0]	3.00 [0, 49.0]	
Missing	6 (0.2%)	2 (0.5%)	
Transfusion # Units PRBC			
Mean (SD)	1.15 (3.69)	2.13 (4.07)	<0.001
Median [Min, Max]	0 [0, 77.0]	0 [0, 38.0]	
Missing	2 (0.1%)	1 (0.2%)	
Vasopressors Post-op			
No	2752 (83.0%)	304 (68.8%)	<0.001
Yes	560 (16.9%)	138 (31.2%)	
Missing	3 (0.1%)	0 (0%)	
Highest Creatinine			
Mean (SD)	1.46 (1.14)	1.80 (1.75)	<0.001
Median [Min, Max]	1.18 [0.0100, 15.4]	1.19 [0.450, 11.8]	
Missing	23 (0.7%)	4 (0.9%)	
POSTOP_GFR			
Mean (SD)	61.3 (24.8)	56.9 (28.1)	0.002
Median [Min, Max]	62.1 [3.02, 342]	58.0 [3.82, 111]	
Missing	23 (0.7%)	4 (0.9%)	
GFR Post-op			
End-stage renal disease	121 (3.7%)	43 (9.7%)	<0.001
Mildly decreased	1210 (36.5%)	137 (31.0%)	
Mildly to severely decreased	1120 (33.8%)	139 (31.4%)	
Normal or increased	482 (14.5%)	66 (14.9%)	
Severely decreased	243 (7.3%)	37 (8.4%)	
Missing	139 (4.2%)	20 (4.5%)	
Any Complications Post-op			
No	2676 (80.7%)	309 (69.9%)	<0.001

	Asymptomatic	Symptomatic	P-value
Yes	638 (19.2%)	133 (30.1%)	
Missing	1 (0.0%)	0 (0%)	
Puncture Site Hematoma or Access Site Occlusion			
No	1258 (37.9%)	158 (35.7%)	0.088
Yes	57 (1.7%)	13 (2.9%)	
Missing	2000 (60.3%)	271 (61.3%)	
Post-op Abnormal Heart Disease or Myocardial Infarction or Dysrhythmia			
No	2995 (90.3%)	387 (87.6%)	0.076
Yes	319 (9.6%)	55 (12.4%)	
Missing	1 (0.0%)	0 (0%)	
Post-op Cerebrovascular Sx			
No	3282 (99.0%)	427 (96.6%)	<0.001
Yes	32 (1.0%)	15 (3.4%)	
Missing	1 (0.0%)	0 (0%)	
Post-op Respiratory			
No	3171 (95.7%)	396 (89.6%)	<0.001
Yes	143 (4.3%)	46 (10.4%)	
Missing	1 (0.0%)	0 (0%)	
Post-op Dialysis			
No	3203 (96.6%)	405 (91.6%)	<0.001
Yes	64 (1.9%)	22 (5.0%)	
Missing	48 (1.4%)	15 (3.4%)	
Arm Ischemia/Emboli			
No	3303 (99.6%)	440 (99.5%)	1
Yes	11 (0.3%)	2 (0.5%)	
Missing	1 (0.0%)	0 (0%)	
Leg Ischemia/Emboli			
No	3246 (97.9%)	423 (95.7%)	0.005
Yes	68 (2.1%)	19 (4.3%)	
Missing	1 (0.0%)	0 (0%)	
Leg Compartment Syndrome			
No	3279 (98.9%)	438 (99.1%)	0.964
Yes	35 (1.1%)	4 (0.9%)	
Missing	1 (0.0%)	0 (0%)	
Post-op Intestinal Ischemia			
No	3252 (98.1%)	431 (97.5%)	0.484
Yes	62 (1.9%)	11 (2.5%)	
Missing	1 (0.0%)	0 (0%)	
Post-op Renal Ischemia			
No	3217 (97.0%)	426 (96.4%)	0.514
Yes	97 (2.9%)	16 (3.6%)	
Missing	1 (0.0%)	0 (0%)	
Post-op Spinal Ischemia			
No	3212 (96.9%)	405 (91.6%)	<0.001
Yes	102 (3.1%)	37 (8.4%)	
Missing	1 (0.0%)	0 (0%)	
Reintervention			
No	3106 (93.7%)	389 (88.0%)	<0.001
Yes	207 (6.2%)	53 (12.0%)	
Missing	2 (0.1%)	0 (0%)	
Discharge Status			

	Asymptomatic	Symptomatic	P-value
Dead	81 (2.4%)	25 (5.7%)	<0.001
Home	2837 (85.6%)	309 (69.9%)	
Homeless	1 (0.0%)	1 (0.2%)	
Nursing Home	100 (3.0%)	24 (5.4%)	
Other Hospital	29 (0.9%)	16 (3.6%)	
Rehab Unit	264 (8.0%)	67 (15.2%)	
Missing	3 (0.1%)	0 (0%)	
Post-treatment Status of All Branches			
No	2842 (85.7%)	319 (72.2%)	<0.001
Yes	471 (14.2%)	122 (27.6%)	
Missing	2 (0.1%)	1 (0.2%)	

Number of re-intervention table

Volume Variables

Volume Variables: `REGIONID`, `CENTERID`, `PHYSICIANID`

Volume of physicians

Boxplot of physicians volumes
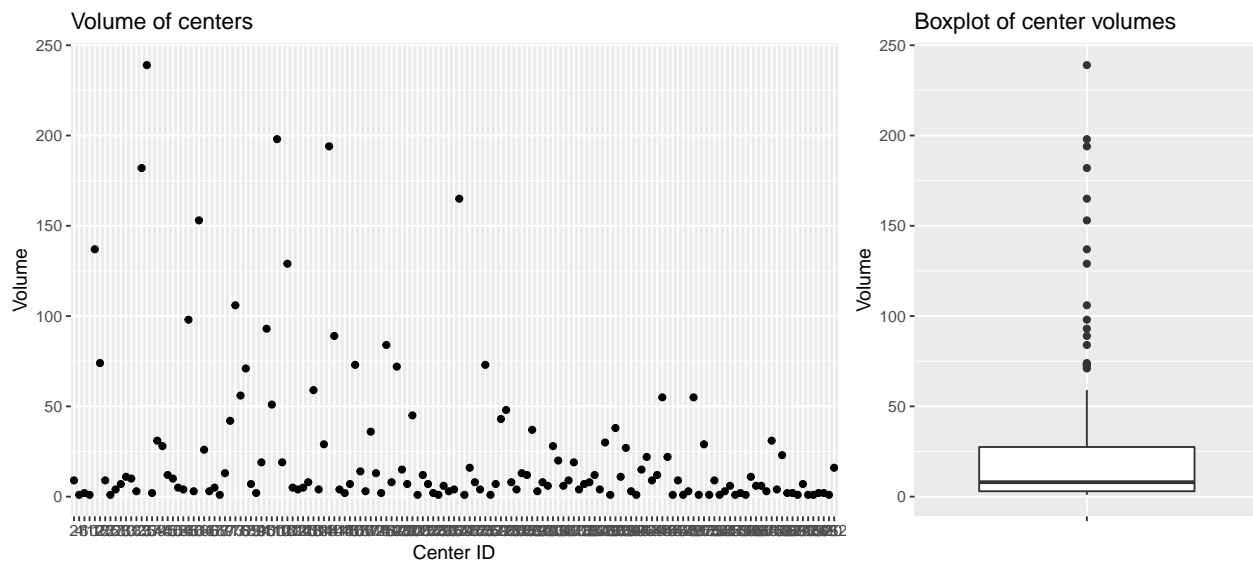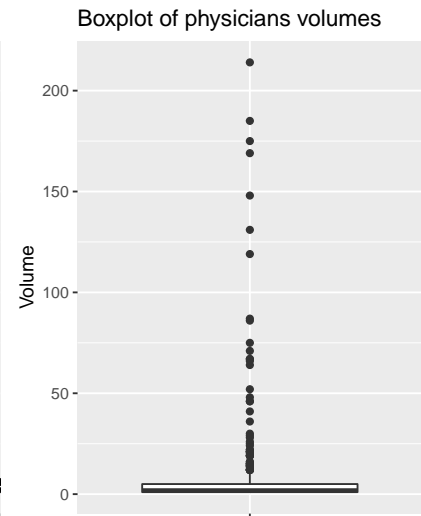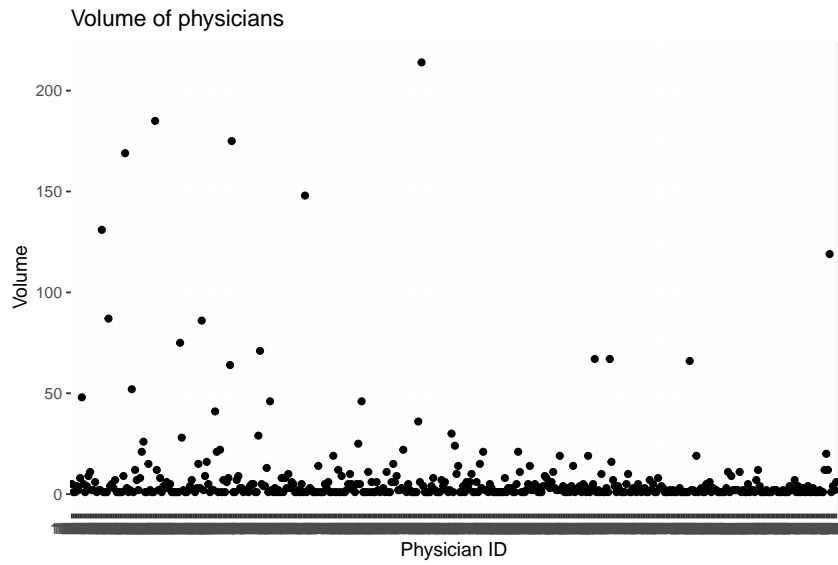
19 regions, 147 centers, 460 physicians.

Quantiles of centers' volume: 1, 3, 8, 27.5, 239

Quantiles of physicians' volume: 1, 1, 2, 5, 214

Code Appendix

```r
knitr::opts_chunk$set(echo = FALSE,message = FALSE,warning = FALSE,fig.width = 10)
library(tidyverse)
library(table1)
library(survival)
library(Hmisc)
library(ggplot2)
library(ggpubr)
library(expss)
## ------------- working directories for Lily ----------
wd_lily = '/Users/hanyiwang/Desktop/Comparative-analysis-of-treatments-of-CAA'
# path_lily = c("../data/FBVAR.csv")
path_lily = c("../data/TEVAR_PROC.csv")


## ------------- working directories for Jenn ----------
#wd_jenn = '/Users/jenniferci/Desktop/Comparative-analysis-of-treatments-of-CAA'
#path_jenn = c(
#  "/Users/jenniferci/Desktop/Comparative-analysis-of-treatments-of-CAA/TEVAR_International_20210712/TE
#  "/Users/jenniferci/Desktop/Comparative-analysis-of-treatments-of-CAA/TEVAR_International_20210712/TE
#  "/Users/jenniferci/Desktop/Comparative-analysis-of-treatments-of-CAA/TEVAR_International_20210901/TE
#  "/Users/jenniferci/Desktop/Comparative-analysis-of-treatments-of-CAA/TEVAR_International_20210901/TE

## ------------- read data ----------
setwd(wd_lily)
TEVAR_PROC = read.csv(path_lily)

#setwd(wd_jenn)
#TEVAR_LTF_07 = read.csv(path_jenn[1])
#TEVAR_PROC_07 = read.csv(path_jenn[2])
#TEVAR_LTF_09 = read.csv(path_jenn[3])
#TEVAR_PROC_09 = read.csv(path_jenn[4])

## ------------- modify variables class----------

names <- c('NUM_TREATED_BRANCHES', 'NUM_TREATED_RENALS',"PREOP_GFR_CAT","POSTOP_GFR_CAT")
TEVAR_PROC[,names] <- lapply(TEVAR_PROC[,names] , factor)

## ------------- modify labels and units ----------
TEVAR_PROC = apply_labels(TEVAR_PROC,
                          ################
                          PRESENTATION = "Presentation",
                          AGE = "Age",
                          AGECAT = "Age categories",
                          GENDER = "Gender",
                          ETHNICITY = "Ethnicity",
                          RACE = "Race",
                          TRANSFER = "Transfer",
                          PRIMARYINSURER = "Primary Insurer",
                          LIVINGSTATUS = "Living Status",
                          PREOP_FUNCSTATUS = "Functional Status",
                          PRIOR_CVD = "Cerebrovascular Disease History",
                          PRIOR_CAD = "Coronary Artery Disease History",
```

```
PRIOR_CHF = "Congestive Heart Failure History",
COPD = "Chronic Obstructive Pulmonary Disorder History",
DIABETES = "Diabetes History",
PREOP_DIALYSIS = "Dialysis Status",
HTN = "Hypertension History",
PREOP_SMOKING = "Smoking Status",
PRIOR_CABG = "History of Coronary Artery Bypass Surgery",
PRIOR_PCI = "History of Percutaneous Coronary Intervention",
PRIOR_ANEURREP = "Aneurysm Repair History",
STRESS = "Stress Test",
PREOP_CREAT = "Creatinine",
PREOP_GFR_CAT = "Glomerular Filtration Rate",
DC_ASA = "Discharge ASA",
DC_P2Y = "Discharge P2Y12 Antagonist",
DC_STATIN = "Discharge Statin",
################
PRIOR_AORSURG = "Prior Aortic Surgery",
PATHOLOGY = "Pathology",
PREOP_MAXAAADIA = "Maximum Aortic Diameter",
URGENCY = "Urgency",
PATHOLOGY_ANEURYSM_TYPE = "Aneurysm Type",
PATHOLOGY_DISSECT_TYPE = "Dissection Type",
PROXZONE_DISEASE = "Proximal Zone of Disease",
GENHIST = "Genetic History",
DISTZONE_DISEASE = "Distal Zone of Disease",
extent = "Type of TAAA",
ANESTHESIA = "Anesthesia",
CONTRAST = "Iodinated Contrast",
EBL = "Estimated Blood Loss",
FLUOROTIME = "Fluoroscopy Time",
INTRAOP_PRBC = "Packed Red Blood Cells given in OR or Preop",
TOTALPROCTIME = "Total Procedure Time",
IVUSTEE = "Intravascular ultrasound (IVUS) or Transesophageal Echo (TEE)",
ACCESS = "Left or Right Access",
ARMNECK_ACCESS = "Arm/Neck Access",
AORDEV_NUM = "Number of Aortic Devices",
AORDEV_CMOD = "Custom/Modified Devices",
DEV_GTYPE = "Graft Type",
ILIACDEV_END_R = "Right Iliac Endpoint",
ILIACDEV_END_L = "Left Iliac Endpoint",
BRANCH_STAGED = "Staged Branch Treatment",
BRANCH_LSUB = "Left Subclavian Proximal Branch Treatment",
BRANCH_CELIAC = "Celiac Proximal Branch Treatment",
BRANCH_SMA = "SMA Proximal Branch Treatment",
BRANCH_RRENAL = "Right Renal Poximal Branch Treatment",
BRANCH_LRENAL = "Left Renal Proximal Branch Treatment",
ANESTHESIA_GEN_TIMEEXT = "Time to Extubation",
POSTOP_SPINALDRAIN = "Spinal Drain Placement",
lrenal = "Treatment Left Renal",
rrenal = "Treatment Right Renal",
sma = "Treatment SMA",
celiac = "Treatment Celiac",
lsub = "Treatment Left Subclavian",
```

```r
                           NUM_TREATED_BRANCHES = "Number of Treated Branches",
                           NUM_TREATED_RENALS = "Number of Treated Renals",
                           OCCLUDED_RENAL = "Number of Occluded Renals",
                           OCCLUDED_SMA = "SMA Proximal Branch Occluded",
                           OCCLUDED_CELIAC  = "Celiac Proximal Branch Occluded",
                           ################
                           DEAD = "Death",
                           PROC_SURVIVALDAYS = "Survival Days",
                           TOTAL_LOS = "Length of stay in days between admission date and discharge date"
                           POSTOP_LOS = "Length of stay in days between surgery date and discharge date"
                           AORDEV_TECHSUCC = "Deployment Technical Success",
                           CONVTOOPEN = "Conversion to Open",
                           LEAKATCOMP_NONE = "Endoleak at Completion of Procedure",
                           ICUSTAY = "ICU Stay",
                           POSTOP_PRBC = "Transfusion # Units PRBC",
                           POSTOP_VASO = "Vasopressors Post-op",
                           POSTOP_HIGHCREAT = "Highest Creatinine",
                           POSTOP_GFR_CAT = "GFR Post-op",
                           POSTOP_COMPLICATIONS = "Any Complications Post-op",
                           ACCESS_COMPLICATION = "Puncture Site Hematoma or Access Site Occlusion",
                           POSTOP_AH = "Post-op Abnormal Heart Disease or Myocardial Infarction or Dysrhy
                           POSTOP_CEREBROSX = "Post-op Cerebrovascular Sx",
                           POSTOP_RESPIRATORY = "Post-op Respiratory",
                           POSTOP_DIALYSIS = "Post-op Dialysis",
                           POSTOP_ARMEMBO = "Arm Ischemia/Emboli",
                           POSTOP_LEGEMBO = "Leg Ischemia/Emboli",
                           POSTOP_LEGCOMPART = "Leg Compartment Syndrome",
                           POSTOP_INTISCH = "Post-op Intestinal Ischemia",
                           POSTOP_RENALISCH = "Post-op Renal Ischemia",
                           POSTOP_SPINAL_ISCHEMIA = "Post-op Spinal Ischemia",
                           RETX_R_RTOR = "Reintervention",
                           DC_STATUS = "Discharge Status",
                           BRANCH_POST = "Post-treatment Status of All Branches"
                           )

## ------------- p-value function ----------

pvalue <- function(x, ...) {
    y <- unlist(x)
    g <- factor(rep(1:length(x), times=sapply(x, length)))
    if (is.numeric(y)) {
        # For numeric variables, Welch's Two Sample t-test
        p <- t.test(y ~ g)$p.value
    } else {
        # For categorical variables, Pearson's Chi-squared Test
        p <- chisq.test(table(y, g))$p.value
    }
    c("", sub("<", "&lt;", format.pval(p, digits=3, eps=0.001)))
}

## ------------- population of interest ----------
table1_POI = table1(~  PRESENTATION, data = TEVAR_PROC)
knitr::kable(table1_POI)
```

```r
## ------------- table: Patient demographic and co-morbidities----------

table1_CMB = table1(~   AGE+AGECAT+GENDER+ETHNICITY+ RACE+ TRANSFER+ PRIMARYINSURER+ LIVINGSTATUS+ PREOP
        | PRESENTATION, data = TEVAR_PROC,overall=F, extra.col=list(`P-value`=pvalue))
knitr::kable(table1_CMB)


## ------------- table:  Operative Variables----------

table1_OPR = table1(~ PRIOR_AORSURG+ PATHOLOGY+ PREOP_MAXAAADIA+ URGENCY+ PATHOLOGY_ANEURYSM_TYPE+ PATHO
        | PRESENTATION, data = TEVAR_PROC,overall=F, extra.col=list(`P-value`=pvalue))

knitr::kable(table1_OPR)


## ------------- table: primary outcomes----------
table1_POC = table1(~ DEAD+PROC_SURVIVALDAYS | PRESENTATION, data = TEVAR_PROC,overall=F, extra.col=list

knitr::kable(table1_POC)


## ------------- table: secondary outcomes----------
table1_SOC = table1(~ TOTAL_LOS+ POSTOP_LOS+ AORDEV_TECHSUCC+ CONVTOOPEN+ LEAKATCOMP_NONE+ ICUSTAY+ POST
        | PRESENTATION, data = TEVAR_PROC,overall=F, extra.col=list(`P-value`=pvalue))

knitr::kable(table1_SOC)


## ------------- table: number of re-intervention ----------



## ------------- clustering variables----------

#FBVAR %>% select(REGIONID) %>% table()
#FBVAR %>% select(CENTERID) %>% table()
#FBVAR %>% select(PHYSICIANID) %>% table()


## ------------- plots of volume----------
center_vol = as.data.frame(TEVAR_PROC %>% select(CENTERID) %>% table())
phys_vol = as.data.frame(TEVAR_PROC %>% select(PHYSICIANID) %>% table())

p1 = ggplot(data = center_vol, aes(x=CENTERID, y=Freq)) +
  geom_point() +
  labs(title = 'Volume of centers',x='Center ID',y='Volume')

p2 = ggplot(data = center_vol, aes(x='', y=Freq)) +
  geom_boxplot() +
  labs(title = 'Boxplot of center volumes',x='',y='Volume')

print(ggarrange(p1, p2, widths = c(20,10),ncol = 2, nrow = 1, align = "h"))

p3 = ggplot(data = phys_vol, aes(x=PHYSICIANID, y=Freq)) +
  geom_point() +
  labs(title = 'Volume of physicians',x='Physician ID',y='Volume')

p4 = ggplot(data = phys_vol, aes(x='', y=Freq)) +
  geom_boxplot() +
```

```
  labs(title = 'Boxplot of physicians volumes',x='',y='Volume')

print(ggarrange(p3, p4, widths = c(20,10),ncol = 2, nrow = 1, align = "h"))
```