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=2706)
PRESENTATION	
Asymptomatic	2391 (88.4%)
Symptomatic	315 (11.6%)

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=2391)	(N=315)	
AGE			
Mean (SD)	73.4 (7.98)	70.2 (10.3)	<0.001
Median [Min, Max]	74.0 [0, 90.0]	71.0 [33.0, 90.0]	
AGECAT			
<50	14 (0.6%)	13 (4.1%)	<0.001
>79	527 (22.0%)	54 (17.1%)	
50-59	87 (3.6%)	33 (10.5%)	
60-69	613 (25.6%)	86 (27.3%)	
70-79	1150 (48.1%)	129 (41.0%)	
GENDER			
female	566 (23.7%)	127 (40.3%)	<0.001
male	1825 (76.3%)	188 (59.7%)	
ETHNICITY			
Hispanic or Latino	83 (3.5%)	13 (4.1%)	0.672
None Hispanic or Latino	2304 (96.4%)	302 (95.9%)	
Missing	4 (0.2%)	0 (0%)	
RACE			
American Indian or Alaskan Native	5 (0.2%)	1 (0.3%)	<0.001
Asian	44 (1.8%)	6 (1.9%)	
Black or African American	154 (6.4%)	48 (15.2%)	
More than 1 race	3 (0.1%)	1 (0.3%)	

	Asymptomatic	Symptomatic	P-value
Native Hawaiian or other Pacific Islander	1 (0.0%)	1 (0.3%)	
Unknown/Other	133 (5.6%)	26 (8.3%)	
White	2051 (85.8%)	232 (73.7%)	
TRANSFER			
Hospital	32 (1.3%)	138 (43.8%)	<0.001
No	2357 (98.6%)	176 (55.9%)	
Rehab Unit	2 (0.1%)	1 (0.3%)	
PRIMARYINSURER			
Commercial	669 (28.0%)	95 (30.2%)	<0.001
Medicaid	47 (2.0%)	24 (7.6%)	
Medicare	1325 (55.4%)	155 (49.2%)	
Military/VA	87 (3.6%)	9 (2.9%)	
Non US Insurance	129 (5.4%)	6 (1.9%)	
Self Pay	11 (0.5%)	10 (3.2%)	
Missing	123 (5.1%)	16 (5.1%)	
LIVINGSTATUS			
Home	2372 (99.2%)	308 (97.8%)	0.047
Homeless	2 (0.1%)	1 (0.3%)	
Nursing home	17 (0.7%)	6 (1.9%)	
PREOP_FUNCSTATUS			
Assisted care	43 (1.8%)	15 (4.8%)	0.003
Bed bound	3 (0.1%)	1 (0.3%)	
Full	1542 (64.5%)	180 (57.1%)	
Light work	546 (22.8%)	77 (24.4%)	
Self care	256 (10.7%)	41 (13.0%)	
Missing	1 (0.0%)	1 (0.3%)	
PRIOR_CVD			
No	2144 (89.7%)	271 (86.0%)	0.063
Yes	247 (10.3%)	44 (14.0%)	
PRIOR_CAD			
No	1707 (71.4%)	215 (68.3%)	0.276
Yes	684 (28.6%)	100 (31.7%)	
PRIOR_CHF			
No	2064 (86.3%)	261 (82.9%)	0.115
Yes	327 (13.7%)	54 (17.1%)	
COPD			
No	1466 (61.3%)	173 (54.9%)	0.034
Yes	925 (38.7%)	142 (45.1%)	
DIABETES			
No	1956 (81.8%)	254 (80.6%)	0.669
Yes	435 (18.2%)	61 (19.4%)	
PREOP_DIALYSIS			
No	2351 (98.3%)	299 (94.9%)	<0.001
Yes	40 (1.7%)	16 (5.1%)	
HTN			
No	257 (10.7%)	27 (8.6%)	0.285
Yes	2127 (89.0%)	286 (90.8%)	
Missing	7 (0.3%)	2 (0.6%)	
PREOP_SMOKING			
No	265 (11.1%)	47 (14.9%)	0.056
Yes	2126 (88.9%)	268 (85.1%)	
PRIOR_CABG			

	Asymptomatic	Symptomatic	P-value
No	1973 (82.5%)	267 (84.8%)	0.369
Yes	417 (17.4%)	48 (15.2%)	
Missing	1 (0.0%)	0 (0%)	
PRIOR_PCI			
No	1839 (76.9%)	255 (81.0%)	0.13
Yes	550 (23.0%)	60 (19.0%)	
Missing	2 (0.1%)	0 (0%)	
PRIOR_ANEURREP			
No	1903 (79.6%)	224 (71.1%)	<0.001
Yes	488 (20.4%)	91 (28.9%)	
STRESS			
No	1217 (50.9%)	242 (76.8%)	<0.001
Yes	1172 (49.0%)	73 (23.2%)	
Missing	2 (0.1%)	0 (0%)	
PREOP_CREAT			
Mean (SD)	1.18 (0.673)	1.15 (0.664)	0.419
Median [Min, Max]	1.08 [0, 14.4]	1.00 [0.400, 7.50]	
Missing	54 (2.3%)	14 (4.4%)	
DC_ASA			
No	336 (14.1%)	37 (11.7%)	0.402
Yes	1989 (83.2%)	260 (82.5%)	
Missing	66 (2.8%)	18 (5.7%)	
DC_P2Y			
No	1003 (41.9%)	157 (49.8%)	0.002
Yes	1321 (55.2%)	140 (44.4%)	
Missing	67 (2.8%)	18 (5.7%)	
DC_STATIN			
No	418 (17.5%)	48 (15.2%)	0.49
Yes	1907 (79.8%)	249 (79.0%)	
Missing	66 (2.8%)	18 (5.7%)	

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=2391)	(N=315)	
PRIOR_AORSURG			
Both	64 (2.7%)	10 (3.2%)	<0.001
Endo	215 (9.0%)	54 (17.1%)	
None	1916 (80.1%)	216 (68.6%)	
Open	196 (8.2%)	35 (11.1%)	
PATHOLOGY			
Aneurysm	2299 (96.2%)	253 (80.3%)	<0.001
Aneurysm from dissection	58 (2.4%)	20 (6.3%)	
Dissection	18 (0.8%)	28 (8.9%)	
PAU/IMH	16 (0.7%)	14 (4.4%)	
PREOP_MAXAAADIA			
Mean (SD)	60.8 (10.3)	65.2 (17.1)	<0.001
Median [Min, Max]	59.0 [5.00, 130]	61.0 [5.50, 126]	
Missing	12 (0.5%)	5 (1.6%)	

	Asymptomatic	Symptomatic	P-value
URGENCY			
Elective	2367 (99.0%)	174 (55.2%)	<0.001
Emergent	2 (0.1%)	24 (7.6%)	
Urgent	22 (0.9%)	117 (37.1%)	
PATHOLOGY_ANEURYSM_TYPE			
Anastomotic	33 (1.4%)	6 (1.9%)	<0.001
Degenerative, fusiform	1993 (83.4%)	212 (67.3%)	
Degenerative, saccular	214 (9.0%)	27 (8.6%)	
Intercostal or visceral patch	12 (0.5%)	1 (0.3%)	
Prior trauma	0 (0%)	2 (0.6%)	
Missing	139 (5.8%)	67 (21.3%)	
PATHOLOGY_DISSECT_TYPE			
Acute, <= 30 days	5 (0.2%)	23 (7.3%)	<0.001
Chronic, >30 days	71 (3.0%)	25 (7.9%)	
Missing	2315 (96.8%)	267 (84.8%)	
PROXZONE_DISEASE			
Mean (SD)	6.83 (1.60)	5.63 (1.97)	<0.001
Median [Min, Max]	7.00 [2.00, 9.00]	6.00 [2.00, 9.00]	
GENHIST			
Ehlers-Danlos	1 (0.0%)	1 (0.3%)	0.188
Marfans	9 (0.4%)	2 (0.6%)	
Non-specific	66 (2.8%)	5 (1.6%)	
None	2315 (96.8%)	307 (97.5%)	
DISTZONE_DISEASE			
10B	513 (21.5%)	51 (16.2%)	<0.001
10L	101 (4.2%)	10 (3.2%)	
10R	147 (6.1%)	17 (5.4%)	
11B	41 (1.7%)	7 (2.2%)	
11L	22 (0.9%)	3 (1.0%)	
11R	27 (1.1%)	6 (1.9%)	
5	13 (0.5%)	2 (0.6%)	
6	16 (0.7%)	9 (2.9%)	
7	14 (0.6%)	16 (5.1%)	
8	117 (4.9%)	24 (7.6%)	
9	1380 (57.7%)	170 (54.0%)	
extent			
Juxtarenal AAA	1020 (42.7%)	70 (22.2%)	<0.001
Type 1 TAAA	5 (0.2%)	1 (0.3%)	
Type 2 TAAA	91 (3.8%)	46 (14.6%)	
Type 3 TAAA	371 (15.5%)	75 (23.8%)	
Type 4 TAAA	724 (30.3%)	87 (27.6%)	
Type 5 TAAA	34 (1.4%)	13 (4.1%)	
Missing	146 (6.1%)	23 (7.3%)	
ANESTHESIA			
General	2365 (98.9%)	307 (97.5%)	0.048
Local	15 (0.6%)	6 (1.9%)	
Regional	11 (0.5%)	2 (0.6%)	
CONTRAST			
Mean (SD)	125 (71.9)	122 (77.1)	0.588
Median [Min, Max]	110 [0, 677]	107 [0, 501]	
Missing	45 (1.9%)	8 (2.5%)	
EBL			

	Asymptomatic	Symptomatic	P-value
Mean (SD)	439 (761)	440 (471)	0.973
Median [Min, Max]	250 [0, 25000]	300 [0, 3000]	
Missing	24 (1.0%)	5 (1.6%)	
FLUOROTIME			
Mean (SD)	73.1 (38.8)	70.6 (45.0)	0.351
Median [Min, Max]	64.9 [1.00, 320]	63.7 [6.80, 285]	
Missing	111 (4.6%)	10 (3.2%)	
INTRAOP_PRBC			
Mean (SD)	0.678 (4.56)	1.13 (2.04)	0.002
Median [Min, Max]	0 [0, 200]	0 [0, 14.0]	
Missing	1 (0.0%)	2 (0.6%)	
TOTALPROCTIME			
Mean (SD)	253 (113)	271 (138)	0.028
Median [Min, Max]	230 [25.0, 911]	240 [52.0, 852]	
Missing	2 (0.1%)	1 (0.3%)	
IVUSTEE			
Both	16 (0.7%)	3 (1.0%)	<0.001
IVUS	370 (15.5%)	96 (30.5%)	
No	1973 (82.5%)	210 (66.7%)	
TEE	22 (0.9%)	6 (1.9%)	
Missing	10 (0.4%)	0 (0%)	
ACCESS			
Open	876 (36.6%)	122 (38.7%)	0.321
Percutaneous	1299 (54.3%)	158 (50.2%)	
Missing	216 (9.0%)	35 (11.1%)	
ARMNECK_ACCESS			
No	1795 (75.1%)	191 (60.6%)	<0.001
Yes	596 (24.9%)	124 (39.4%)	
AORDEV_NUM			
Mean (SD)	2.25 (0.890)	2.57 (1.25)	<0.001
Median [Min, Max]	2.00 [1.00, 6.00]	2.00 [1.00, 6.00]	
AORDEV_CMOD			
No	643 (26.9%)	84 (26.7%)	0.986
Yes	1748 (73.1%)	231 (73.3%)	
DEV_GTYPE			
Custom	1241 (51.9%)	75 (23.8%)	<0.001
Physician modified	445 (18.6%)	133 (42.2%)	
Standard	705 (29.5%)	107 (34.0%)	
ILIACDEV_END_R			
Common	1345 (56.3%)	114 (36.2%)	0.045
External, Unintended	16 (0.7%)	3 (1.0%)	
External,Intended	172 (7.2%)	26 (8.3%)	
None	20 (0.8%)	1 (0.3%)	
Missing	838 (35.0%)	171 (54.3%)	
ILIACDEV_END_L			
Common	1376 (57.5%)	113 (35.9%)	0.189
External, Unintended	9 (0.4%)	2 (0.6%)	
External,Intended	129 (5.4%)	17 (5.4%)	
None	19 (0.8%)	1 (0.3%)	
Missing	858 (35.9%)	182 (57.8%)	
BRANCH_STAGED			
No	2258 (94.4%)	287 (91.1%)	0.017

	Asymptomatic	Symptomatic	P-value
Yes	128 (5.4%)	28 (8.9%)	
Missing	5 (0.2%)	0 (0%)	
BRANCH_LSUB			
No	2349 (98.2%)	285 (90.5%)	<0.001
Yes	42 (1.8%)	30 (9.5%)	
BRANCH_CELIAC			
No	1129 (47.2%)	64 (20.3%)	<0.001
Yes	1262 (52.8%)	251 (79.7%)	
BRANCH_SMA			
No	342 (14.3%)	21 (6.7%)	<0.001
Yes	2049 (85.7%)	294 (93.3%)	
BRANCH_RRENAL			
No	19 (0.8%)	17 (5.4%)	<0.001
Yes	2372 (99.2%)	298 (94.6%)	
BRANCH_LRENAL			
No	19 (0.8%)	17 (5.4%)	<0.001
Yes	2372 (99.2%)	298 (94.6%)	
ANESTHESIA_GEN_TIMEEXT			
<12 hrs	128 (5.4%)	25 (7.9%)	<0.001
>24 hrs	60 (2.5%)	23 (7.3%)	
12-24 hrs	67 (2.8%)	15 (4.8%)	
In OR	2103 (88.0%)	243 (77.1%)	
Missing	33 (1.4%)	9 (2.9%)	
POSTOP_SPINALDRAIN			
No	1952 (81.6%)	207 (65.7%)	<0.001
Yes	439 (18.4%)	108 (34.3%)	
lrenal			
None	245 (10.2%)	34 (10.8%)	0.002
Occluded/Covered	63 (2.6%)	19 (6.0%)	
Scallop/Fen/Branch/Chimney	2057 (86.0%)	244 (77.5%)	
Missing	26 (1.1%)	18 (5.7%)	
rrenal			
None	268 (11.2%)	50 (15.9%)	<0.001
Occluded/Covered	59 (2.5%)	17 (5.4%)	
Scallop/Fen/Branch/Chimney	1972 (82.5%)	221 (70.2%)	
Missing	92 (3.8%)	27 (8.6%)	
sma			
None	190 (7.9%)	28 (8.9%)	0.8
Occluded/Covered	3 (0.1%)	0 (0%)	
Scallop/Fen/Branch/Chimney	1849 (77.3%)	266 (84.4%)	
Missing	349 (14.6%)	21 (6.7%)	
celiac			
None	300 (12.5%)	45 (14.3%)	0.005
Occluded/Covered	57 (2.4%)	22 (7.0%)	
Scallop/Fen/Branch/Chimney	900 (37.6%)	184 (58.4%)	
Missing	1134 (47.4%)	64 (20.3%)	
lsub			
None	11 (0.5%)	9 (2.9%)	0.091
Occluded/Covered	3 (0.1%)	9 (2.9%)	
Scallop/Fen/Branch/Chimney	7 (0.3%)	3 (1.0%)	
Missing	2370 (99.1%)	294 (93.3%)	
NUM_TREATED_BRANCHES			

	Asymptomatic	Symptomatic	P-value
1	289 (12.1%)	54 (17.1%)	<0.001
2	561 (23.5%)	60 (19.0%)	
3	797 (33.3%)	63 (20.0%)	
4	744 (31.1%)	138 (43.8%)	
NUM_TREATED_RENALS			
0	334 (14.0%)	71 (22.5%)	<0.001
1	85 (3.6%)	23 (7.3%)	
2	1972 (82.5%)	221 (70.2%)	
OCCLUDED_RENAL			
Yes	63 (2.6%)	19 (6.0%)	0.002
No	2328 (97.4%)	296 (94.0%)	
OCCLUDED_SMA			
Yes	3 (0.1%)	0 (0%)	1
No	2388 (99.9%)	315 (100%)	
OCCLUDED_CELIAC			
Yes	57 (2.4%)	22 (7.0%)	<0.001
No	2334 (97.6%)	293 (93.0%)	

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=2391)	(N=315)	
DEAD			
Yes	300 (12.5%)	68 (21.6%)	<0.001
No	2091 (87.5%)	247 (78.4%)	
PROC_SURVIVALDAYS			
Mean (SD)	723 (742)	597 (729)	0.004
Median [Min, Max]	437 [0, 3390]	336 [0, 3290]	

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

	Asymptomatic	Symptomatic	P-value
	(N=2391)	(N=315)	
TOTAL_LOS			
Mean (SD)	6.34 (21.1)	12.7 (30.5)	<0.001
Median [Min, Max]	3.00 [0, 372]	8.00 [1.00, 376]	
POSTOP_LOS			
<= 7	2056 (86.0%)	206 (65.4%)	<0.001
> 7	335 (14.0%)	109 (34.6%)	
AORDEV_TECHSUCC			
No	66 (2.8%)	12 (3.8%)	0.314
Yes	2153 (90.0%)	268 (85.1%)	
Missing	172 (7.2%)	35 (11.1%)	
CONVTOOPEN			
No	2381 (99.6%)	314 (99.7%)	1
Yes	10 (0.4%)	1 (0.3%)	

	Asymptomatic	Symptomatic	P-value
LEAKATCOMP_NONE			
No	806 (33.7%)	90 (28.6%)	0.788
Yes	1531 (64.0%)	179 (56.8%)	
Missing	54 (2.3%)	46 (14.6%)	
ICUSTAY			
Mean (SD)	2.13 (4.60)	4.25 (5.52)	<0.001
Median [Min, Max]	1.00 [0, 85.0]	3.00 [0, 49.0]	
Missing	2 (0.1%)	1 (0.3%)	
POSTOP_PRBC			
Mean (SD)	1.25 (4.08)	2.20 (4.28)	<0.001
Median [Min, Max]	0 [0, 77.0]	0 [0, 38.0]	
Missing	2 (0.1%)	0 (0%)	
POSTOP_VASO			
No	1991 (83.3%)	222 (70.5%)	<0.001
Yes	398 (16.6%)	93 (29.5%)	
Missing	2 (0.1%)	0 (0%)	
POSTOP_HIGHCREAT			
Mean (SD)	1.47 (1.12)	1.88 (1.86)	<0.001
Median [Min, Max]	1.19 [0.0100, 15.4]	1.20 [0.450, 11.8]	
Missing	15 (0.6%)	4 (1.3%)	
POSTOP_COMPLICATIONS			
No	1907 (79.8%)	220 (69.8%)	<0.001
Yes	483 (20.2%)	95 (30.2%)	
Missing	1 (0.0%)	0 (0%)	
ACCESS_COMPLICATION			
No	431 (18.0%)	57 (18.1%)	0.267
Yes	29 (1.2%)	7 (2.2%)	
Missing	1931 (80.8%)	251 (79.7%)	
POSTOP_AH			
No	2157 (90.2%)	278 (88.3%)	0.323
Yes	234 (9.8%)	37 (11.7%)	
POSTOP_CEREBROSX			
No	2361 (98.7%)	305 (96.8%)	0.013
Yes	29 (1.2%)	10 (3.2%)	
Missing	1 (0.0%)	0 (0%)	
POSTOP_RESPIRATORY			
No	2280 (95.4%)	281 (89.2%)	<0.001
Yes	111 (4.6%)	34 (10.8%)	
POSTOP_DIALYSIS			
No	2311 (96.7%)	285 (90.5%)	<0.001
Yes	47 (2.0%)	17 (5.4%)	
Missing	33 (1.4%)	13 (4.1%)	
POSTOP_ARMEMBO			
No	2380 (99.5%)	313 (99.4%)	1
Yes	11 (0.5%)	2 (0.6%)	
POSTOP_LEGEMBO			
No	2335 (97.7%)	298 (94.6%)	0.003
Yes	56 (2.3%)	17 (5.4%)	
POSTOP_LEGCOMPART			
No	2367 (99.0%)	311 (98.7%)	0.887
Yes	24 (1.0%)	4 (1.3%)	
POSTOP_INTISCH			

	Asymptomatic	Symptomatic	P-value
Mean (SD)	0.0439 (0.365)	0.0635 (0.461)	0.469
Median [Min, Max]	0 [0, 4.00]	0 [0, 4.00]	
POSTOP_RENALISCH			
No	2313 (96.7%)	303 (96.2%)	0.732
Yes	78 (3.3%)	12 (3.8%)	
POSTOP_SPINAL_ISCHEMIA			
No	2315 (96.8%)	292 (92.7%)	<0.001
Yes	76 (3.2%)	23 (7.3%)	
RETX_R_RTOR			
No	2243 (93.8%)	280 (88.9%)	0.001
Yes	147 (6.1%)	35 (11.1%)	
Missing	1 (0.0%)	0 (0%)	
DC_STATUS			
Dead	65 (2.7%)	17 (5.4%)	<0.001
Home	2011 (84.1%)	221 (70.2%)	
Homeless	1 (0.0%)	1 (0.3%)	
Nursing Home	89 (3.7%)	22 (7.0%)	
Other Hospital	21 (0.9%)	14 (4.4%)	
Rehab Unit	204 (8.5%)	40 (12.7%)	
BRANCH_POST			
No	2048 (85.7%)	231 (73.3%)	<0.001
Yes	340 (14.2%)	83 (26.3%)	
Missing	3 (0.1%)	1 (0.3%)	

Volume Variables

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

Volume of physicians

Boxplot of physicians volumes
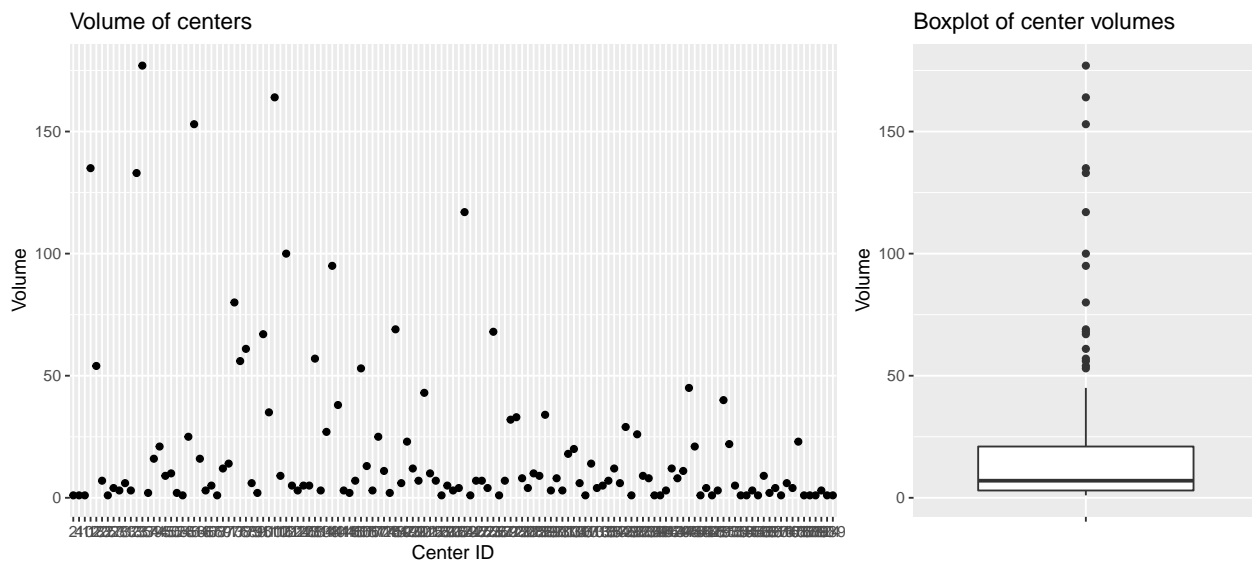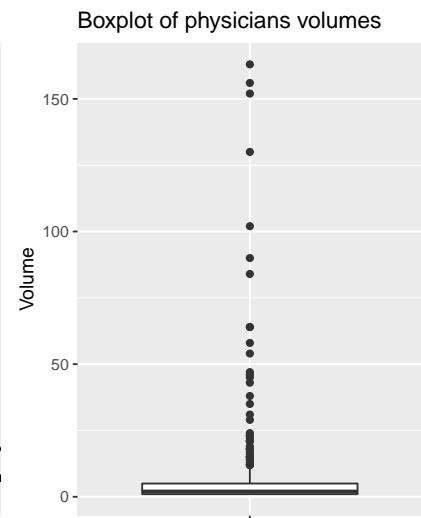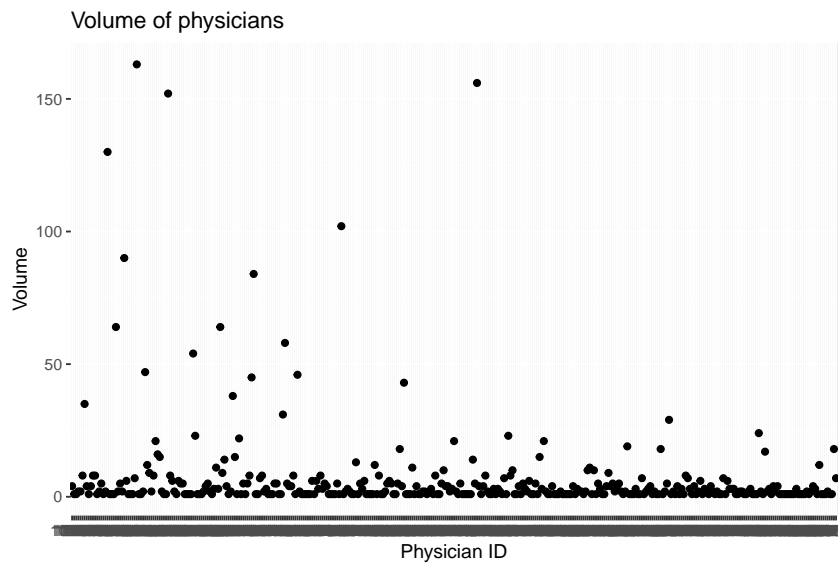
19 regions, 133 centers, 367 physicians.

Quantiles of centers' volume: 1, 3, 7, 21, 177

Quantiles of physicians' volume: 1, 1, 2, 5, 163

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)


## ------------- 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')
TEVAR_PROC[,names] <- lapply(TEVAR_PROC[,names] , factor)


## ------------- 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)))
}
```

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

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)


## ------------- 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() +
```

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

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