

Mid-America Vascular Study Group (MAVSG)

***Interpreting statistics in VQI and
VQI literature***



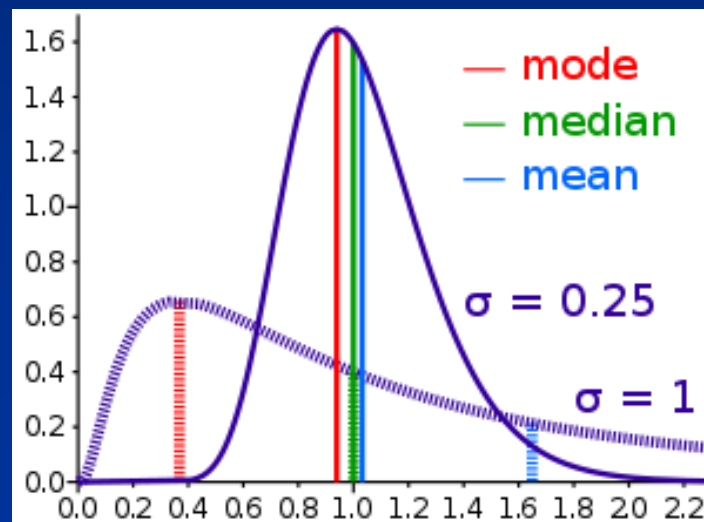
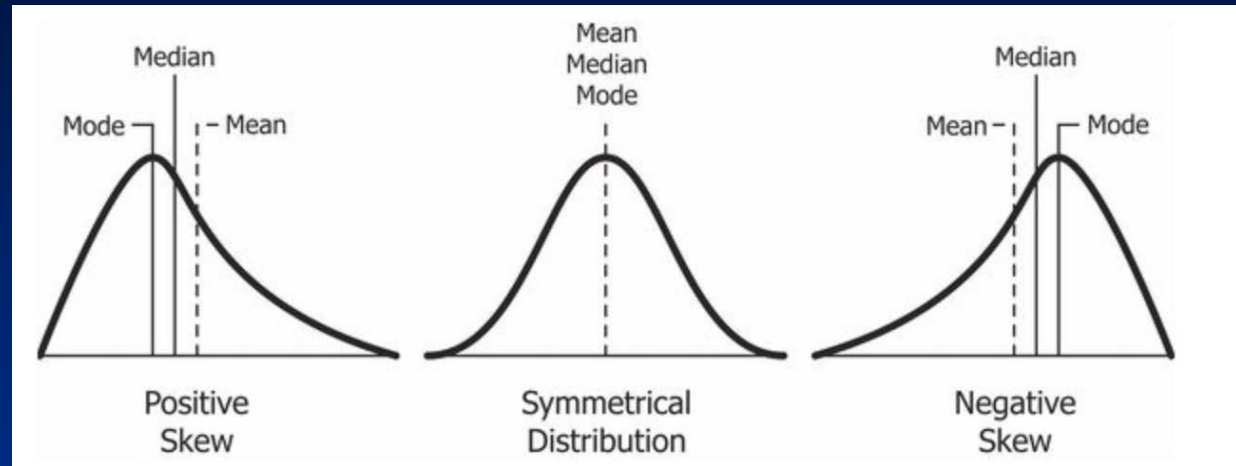
Review dashboard data

Data presented in 1st quartile, *median*, and 3rd quartile

Registry	Outcome	Your Center % (n/N)	Your Region [25p 50p 75p]	VQI Overall [25p 50p 75p]
All	Total Procedure Volume		[18 64 281]	[25 105 268]
Multiple (Jan-Dec 2017)	Long-Term Follow-Up		[57% 70% 88%]	[47% 73% 88%]
Multiple	Discharge Medications		[86% 92% 100%]	[79% 87% 95%]
AVACCESS	Primary AVF vs. Graft		[78% 85% 91%]	[77% 88% 93%]
Transfemoral CAS	Stroke/Death in Hospital		[0% 0% 0%]	[0% 0% 0%]
TCAR	Stroke/Death in Hospital		[0% 0% 0%]	[0% 0% 0%]
CEA	Asymptomatic Stroke/Death in Hospital		[0% 0% 0%]	[0% 0% 0%]
CEA	Symptomatic Stroke/Death in Hospital		[0% 0% 0%]	[2% 0% 0%]
CEA	Asymptomatic LOS>1 Day		[28% 19% 11%]	[30% 19% 11%]
CEA	Symptomatic LOS>1 Day		[33% 27% 13%]	[40% 25% 12%]
EVAR	LOS>2 Days		[13% 5% 0%]	[16% 9% 0%]
EVAR (Jan-Dec 2017)	Sac Diameter Reported at LTFU		[63% 74% 85%]	[37% 66% 79%]
INFRA	Major Complications		[10% 0% 0%]	[7% 2% 0%]
IVCF (Jul 2018-Jun 2019)	Filter Retrieval		[28% 47% 63%]	[0% 7% 42%]
LEAMP	Postop Complications		[17% 16% 11%]	[16% 10% 5%]
OAAA	In-Hospital Mortality		NA (<3 centers)	[6% 0% 0%]
PVI	ABI/Toe Pressure Reported		[81% 87% 95%]	[67% 85% 94%]
SUPRA	Postop Complications		NA (<3 centers)	[6% 0% 0%]
TEVAR (Jan-Dec 2017)	Sac Diameter Reported at LTFU		[41% 50% 60%]	[28% 60% 77%]
EVAR	SVS Sac Size Guideline		[62% 70% 75%]	[62% 71% 83%]
OAAA	Cell-Saver Guideline		NA (<3 centers)	[95% 100% 100%]
OAAA	Iliac Inflow Guideline		NA (<3 centers)	[100% 100% 100%]

This suggests nonparametric (skewed) data

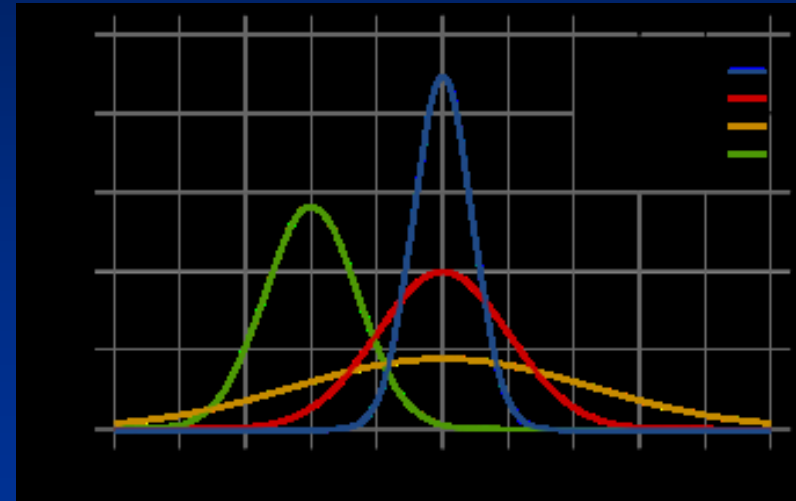
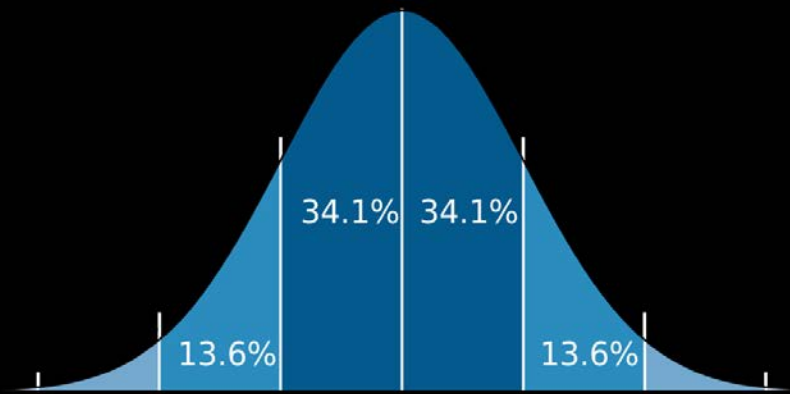
Median is more representative of the center of the data than the **mean**. (e.g., **Case volume** is strongly **positively skewed**)



NORMAL (Gaussian) DISTRIBUTIONS have a fixed set of parameters

Mean, standard deviation

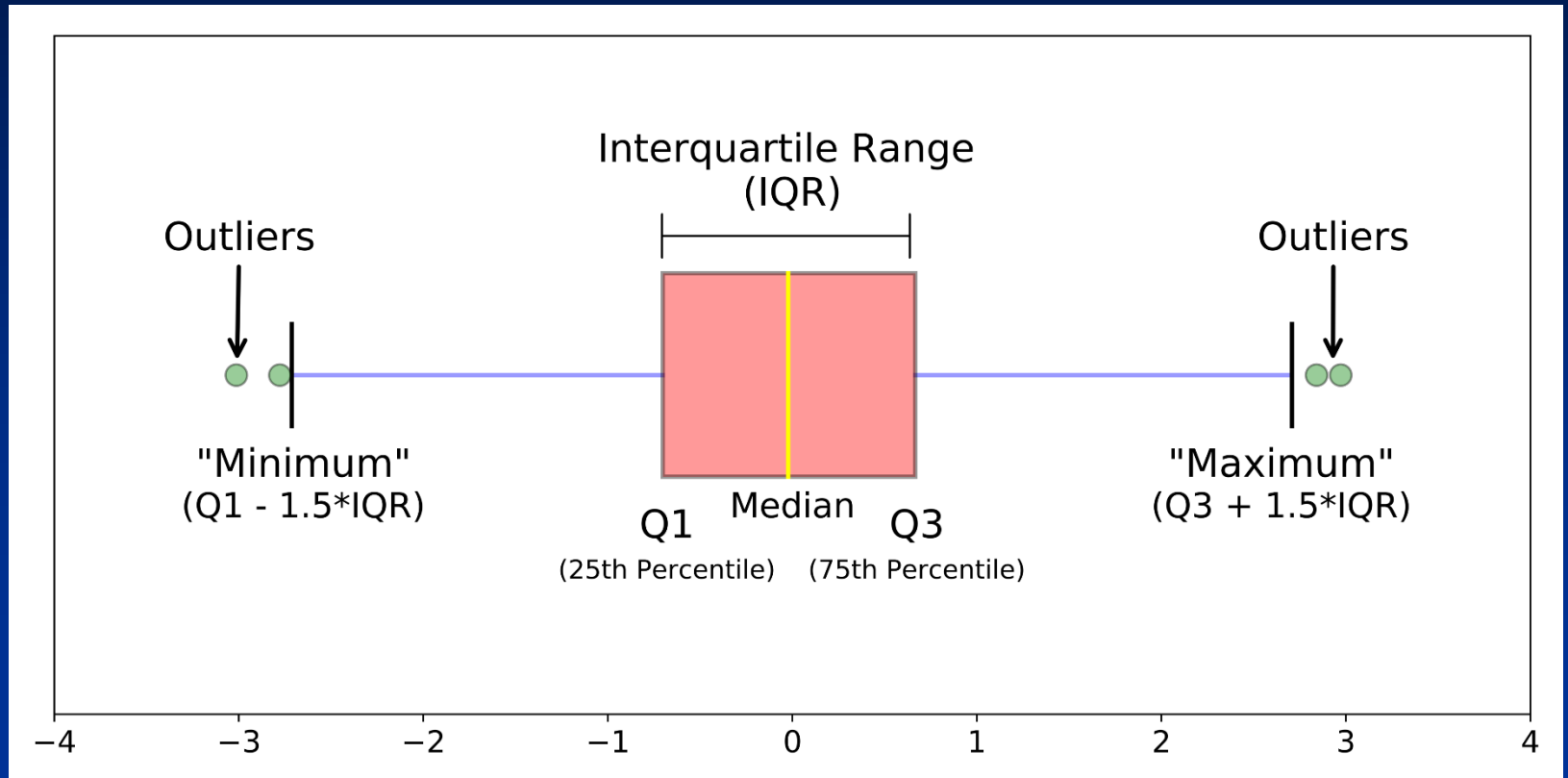
-parametric statistical tests used.



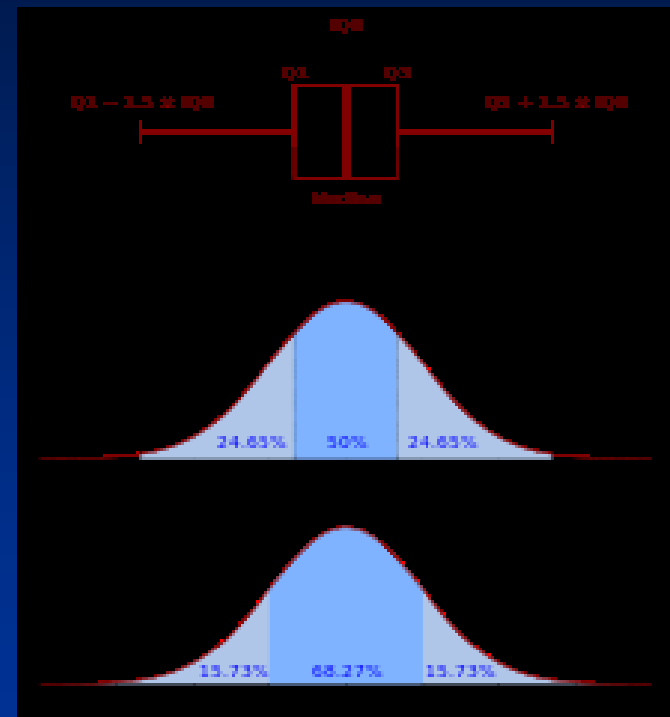
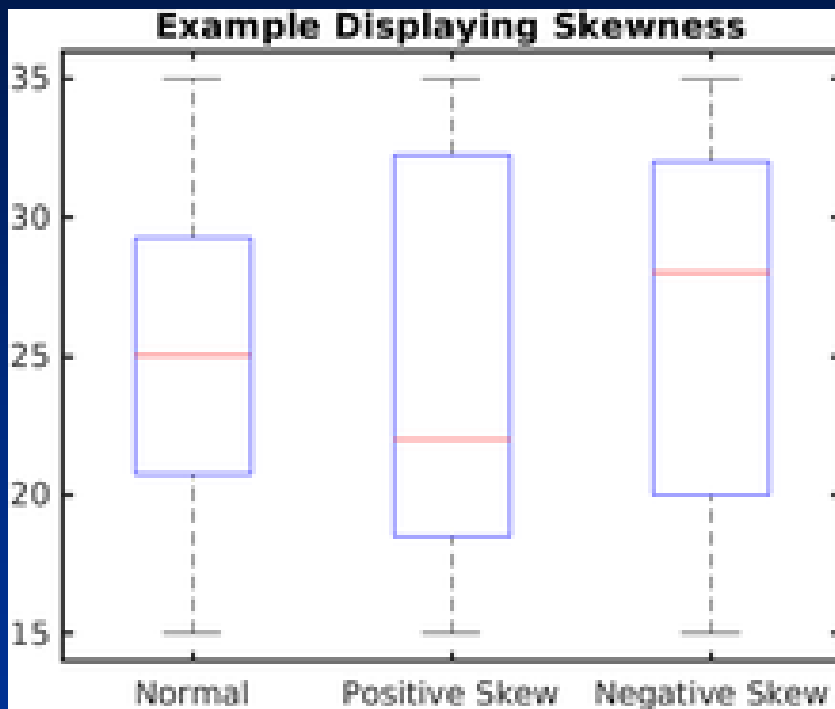
1st quartile, median, and 3rd quartile

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Boxplot



Boxplot used frequently to represent non-parametrical (skewed) data

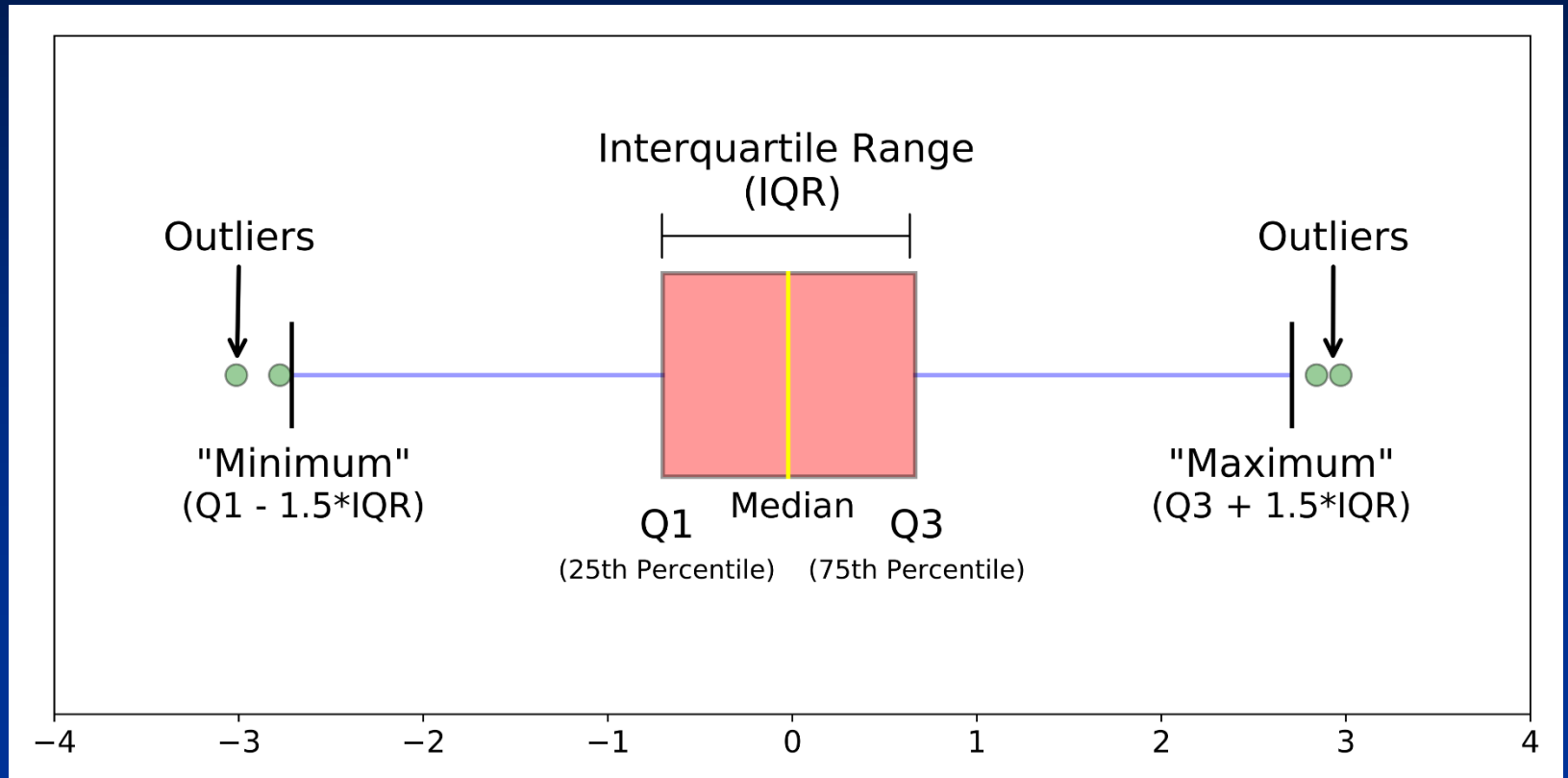


Normal distribution

What do the whiskers mean?

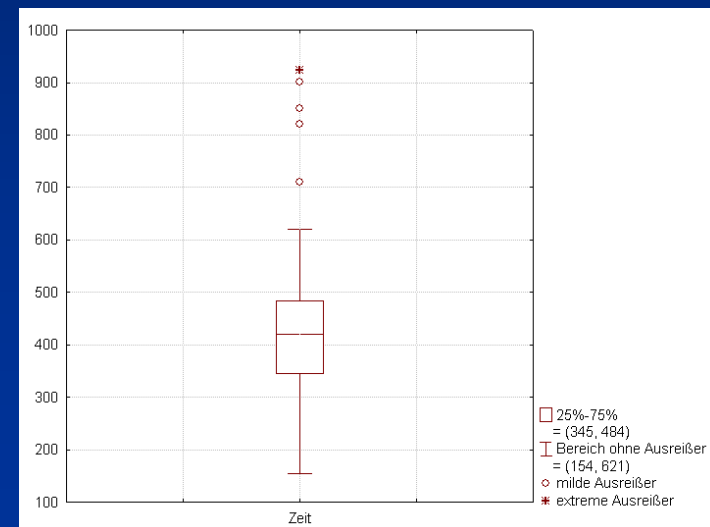
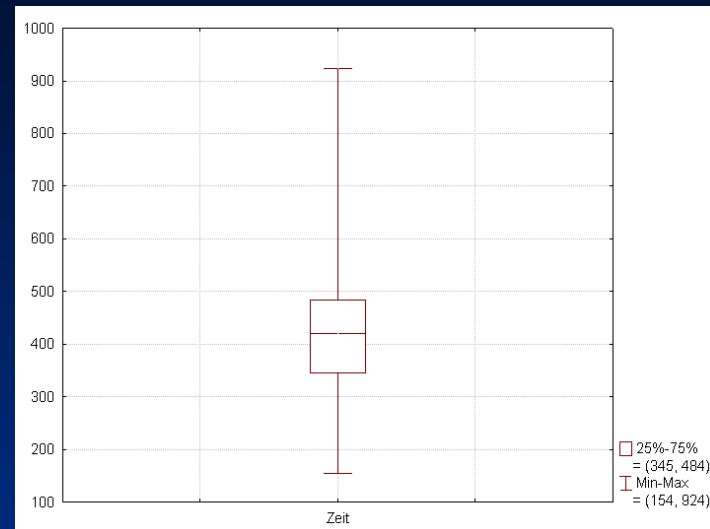


Most commonly



Alternative, less conventional meanings:

- 1) the minimum and maximum of all of the data (as in top figure)
- 2) one standard deviation above and below the mean of the data
- 3) the 9th percentile and the 91st percentile
- 4) the 2nd percentile and the 98th percentile.



Variation in center-level frailty burden and the impact of frailty on long-term survival in patients undergoing elective repair for abdominal aortic aneurysms

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Journal of Vascular Surgery

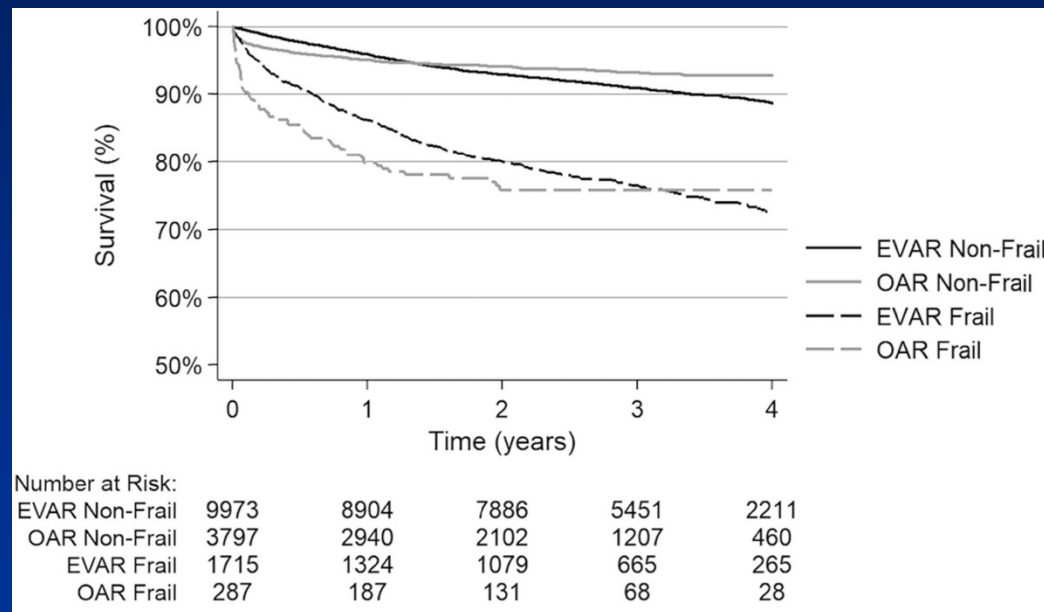
Volume 71 Pages 46-55.e4 (January 2020)

ARTICLE HIGHLIGHTS

• Type of Research: Retrospective review of prospectively collected Vascular Quality Initiative (VQI) data

• Key Findings: In 15,803 patients undergoing elective open abdominal aortic aneurysm repair or endovascular abdominal aortic aneurysm repair, frailty, as measured by the VQI-derived Risk Analysis Index, was independently associated with long-term mortality (hazard ratio, 2.88; 95% confidence interval, 2.6-3.2) and nonhome discharge. Open abdominal aortic aneurysm repair was associated with nonhome discharge but not long-term mortality. Preoperative frailty varied significantly across centers ($F = 2.41$; $P < .001$).

• Take Home Message: Routine measurement of frailty preoperatively to identify high-risk patients and implementation of perioperative interventions may help mitigate procedural and long-term outcomes and improve shared decision-making regarding abdominal aortic aneurysm repair



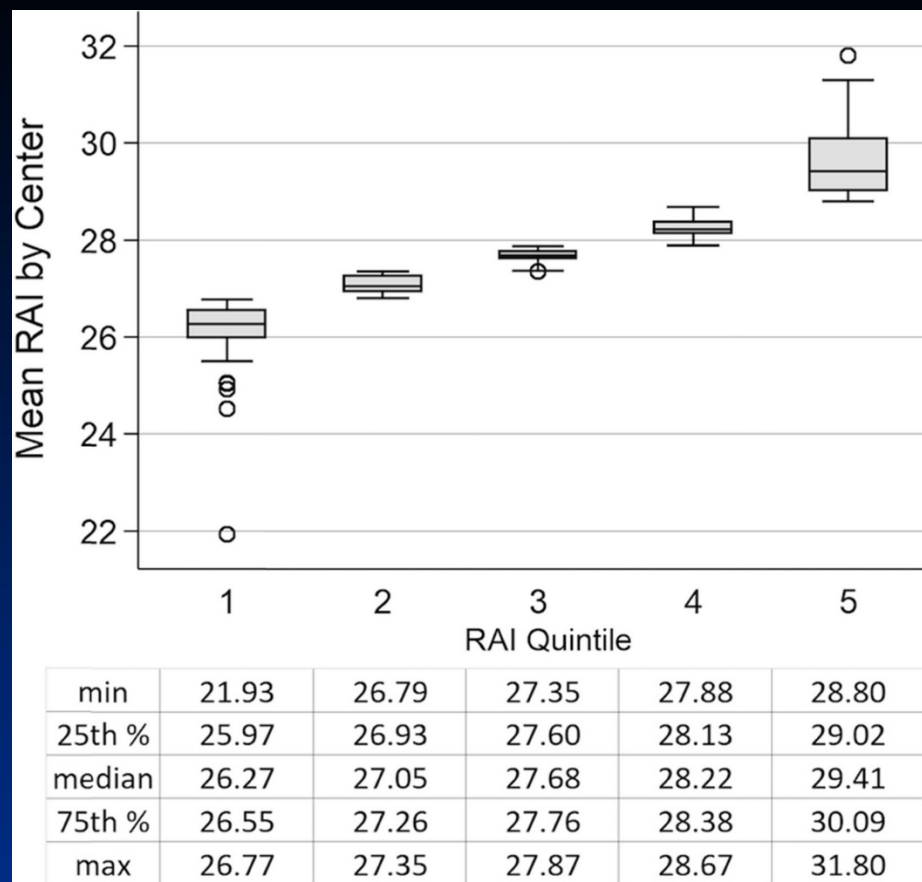


Fig 1. Variation in center-level frailty burden arranged by quintile based on the average Vascular Quality Initiative (VQI)-derived Risk Analysis Index (RAI) score of patients treated at those centers from smallest to largest (n $\frac{1}{4}$ 185 centers). Center-level VQI-RAI differences were assessed by the analysis of variance test. The horizontal line in the middle of each box indicates the median; the top and bottom borders of the box mark the 75th and 25th percentiles, respectively, and the **whiskers above and below the box indicate the minimum and maximum range in either direction.**

Non parametric test needed for skewed data

Parametric test	Non-Parametric equivalent
Paired t-test	Wilcoxon Rank sum Test
Unpaired t-test	Mann-Whitney U test
Pearson correlation	Spearman correlation
One way Analysis of variance	Kruskal Wallis Test

Spearman correlation test used

Table II. Comparison of how the components of the Vascular Quality Initiative-derived Risk Analysis Index (VQI-RAI) varied across the center-level quintiles (185 centers and 15,803 patients)^a

Variables	Center-level quintile					P value ^b
	1	2	3	4	5	
Centers within each quantile, No.	37	37	37	37	37	
Patients within center-level quantile, No. (% total patients)	2642 (16.7)	3347 (21.2)	4342 (27.5)	3668 (23.2)	1804 (11.4)	
VQI-RAI components						
Age, mean (SD), years	70.9 (8.6)	72.3 (8.4)	72.9 (8.7)	73.9 (8.6)	74.4 (8.8)	<.001
Underweight or morbidly obese, No. (%)	343 (13.0)	486 (14.5)	637 (14.7)	597 (16.3)	316 (17.5)	<.001
Renal failure (Cr >1.78 mg/dL or on dialysis), No. (%)	139 (5.3)	158 (4.7)	241 (5.6)	229 (6.2)	132 (7.3)	<.001
Congestive heart failure, No. (%)	196 (7.4)	339 (10.1)	539 (12.4)	373 (10.2)	305 (16.9)	<.001
Dyspnea, No. (%)	93 (3.5)	163 (4.9)	172 (4.0)	198 (5.4)	94 (5.2)	.003
Residence other than independent living, No. (%)	26 (1.0)	45 (1.3)	56 (1.3)	65 (1.8)	48 (2.7)	<.001
ADL (partially or totally dependent), No. (%)	118 (4.5)	182 (5.4)	341 (7.9)	299 (8.2)	262 (14.5)	<.001
Male sex, No. (%)	2098 (79.4)	2630 (78.6)	3487 (80.3)	2910 (79.3)	1393 (77.2)	.431
Frail, No. (%)	205 (7.8)	345 (10.3)	551 (12.7)	546 (14.9)	363 (20.1)	<.001
Proportion OAR, No. (%)	1075 (40.7)	1036 (31.0)	1046 (24.1)	735 (20.0)	217 (12.0)	<.001

ADL, Activities of daily living; Cr, creatinine; OAR, open abdominal aortic aneurysm repair; RAI, Risk Analysis Index; SD, standard deviation; VQI, Vascular Quality Initiative.

^aComparison of individual VQI-RAI components, percentage of frail patients, and average proportion of OAR across quintiles grouped by mean VQI-RAI score. Note the inverse relationship between frailty burden and proportion of OAR performed within each quintile.

^bP values were calculated by Spearman nonparametric tests for trend.