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VQI literature review

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From the Society for Vascular Surgery

Endovascular aneurysm repair patients who are lost to follow-up have worse outcomes

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- SVS guidelines: 1m and 12m follow up with imaging after EVAR – Yearly after 12m
- Wu et al. recently reported incomplete surveillance in >50% patients
- Garg et al. demonstrated similar findings in Medicare population
- No data describing outcomes after different follow up methods

DATA SOURCE

- VQI: Elective EVAR patients 01/2003-12/2015
- Follow-up method: in-person, phone, lost to follow up (LTF)
 - If multiple follow up visits, last one was used

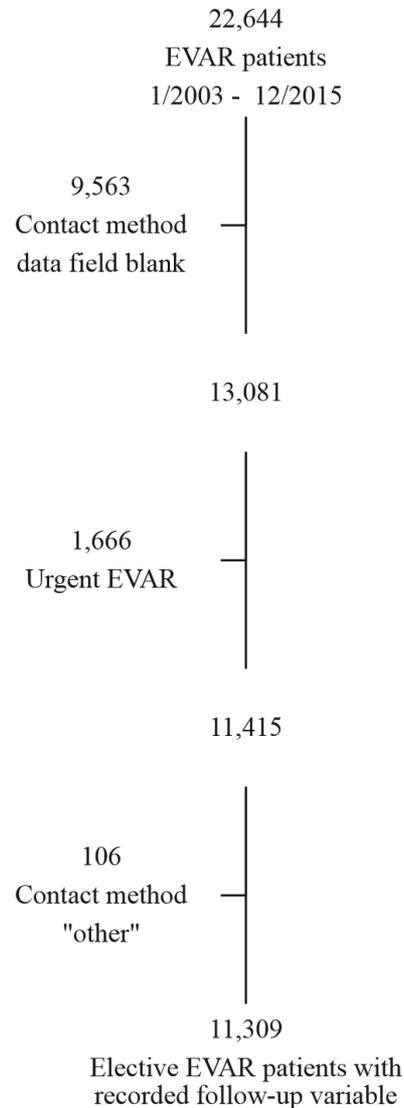
OUTCOMES

- Primary – Mortality
- Secondary (In-person vs phone) – Postoperative imaging, endoleak, secondary interventions, conversion to open repair

STATISTICAL ANALYSIS

- Descriptive statistics
- T-test or ANOVA for univariate analysis
- Multivariate cox proportional hazard models
- Coarsened exact matching analysis

RESULTS – Cohort characteristics



- 78.2% had in-person follow up
- 10.8% had phone follow up
- 11% were lost to follow up

Fig 1. Study cohort. *EVAR*, Endovascular aneurysm repair.

- Were older
- More likely to be female

• **DIFFICULT
OPERATIONS IN
SICK PATIENTS**

• an endoleak, contrast use, FRBC, postop
vasopressors and high postop morbidity

RESULTS – Unadjusted outcomes

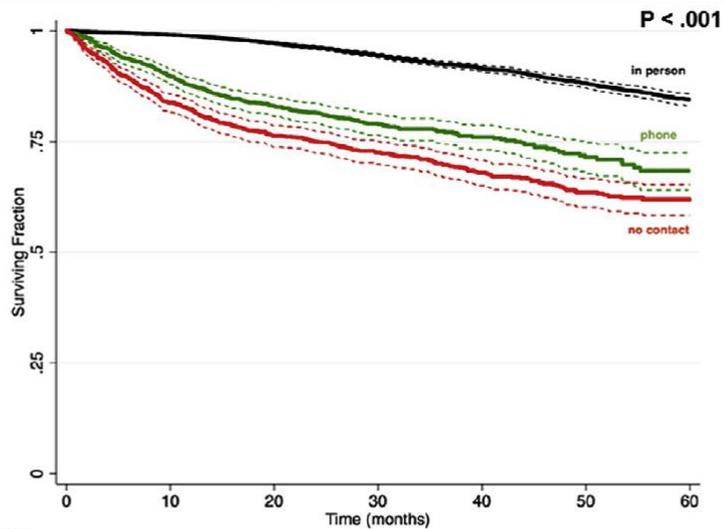
Table III. Univariable outcomes

Outcome	Follow-up method			P value
	In-person (n = 8848)	Phone call (n = 1222)	LTF (n = 1239)	
Mortality (overall)	8.66 (766)	24.1 (294)	32.6 (404)	<.001
Survival, months	36.6 ± 0.3	32.3 ± 0.7	32.2 ± 0.6	<.001
Follow-up, months	13.1 ± 0.1	13.5 ± 0.2	1.2 ± 0.1	<.001
Documented postoperative imaging at last follow-up	85.1 (7530)	56.1 (685)	19.4 (240)	<.001
Secondary intervention required	2.9 (257/8848)	2.0 (24/1222)		.06

LTF, Lost to follow-up.
Categorical data are presented as percentage (number). Continuous data are presented as mean values ± standard error.

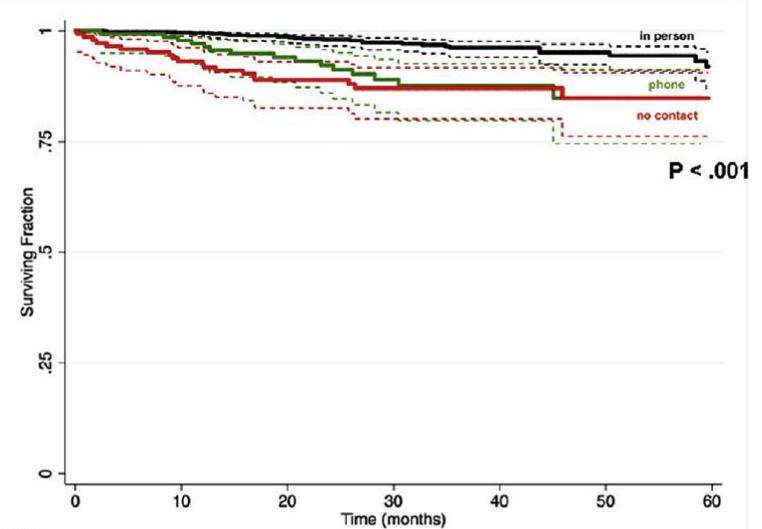
RESULTS – Survival

A Unmatched cohort



Number at risk	0	10	20	30	40	50	60
in person	8848	8482	6837	4668	2880	1677	1031
phone	1222	1082	836	558	319	166	77
no contact	1239	1036	841	625	401	238	124

B Matched cohort



Number at risk	0	10	20	30	40	50	60
in person	765	736	587	388	232	127	72
phone	139	135	107	67	42	24	12
no contact	145	135	117	82	55	33	17

Fig 2. Kaplan-Meier curves showing survival after endovascular aneurysm repair (EVAR) among patients with in-person follow-up vs phone call follow-up vs no follow-up using the aggregate unmatched cohort (**A**) and matched cohort (**B**).

RESULTS – Multivariate analysis

Variable	HR (95% CI)	P value
Follow-up method		
In-person	Reference	—
Phone call	3.48 (2.66-4.57)	<.001
None	6.45 (4.89-8.51)	<.001
Age (per year)	1.05 (1.04-1.06)	<.001
Black race	0.62 (0.37-1.04)	.07
Primary insurance, self-pay	2.61 (1.18-5.78)	.02
Unfit for open surgery	1.60 (1.28-2.00)	<.001
Smoking (any)	1.27 (0.97-1.68)	.09
CHF	1.60 (1.26-2.03)	<.001
COPD	1.25 (1.02-1.54)	.03
Dialysis	2.68 (1.56-4.62)	<.001
Postoperative renal failure		
Acute kidney injury	1.66 (1.06-2.62)	.03
Temporary dialysis	5.80 (2.44-13.8)	<.001
Discharge to nursing home	2.01 (1.39-2.90)	.04

CHF, Congestive heart failure; CI, confidence interval; COPD, chronic obstructive pulmonary disease; HR, hazard ratio.
^aC statistic = 0.81.

LIMITATIONS

- Large amount of missing data (42% missing follow-up classification)
- Dependence on accurate entry of patient data
- Limited definition of follow-up
- No information about number of visits or follow up with local physicians instead of operating surgeon
- Lack of detailed anatomic information

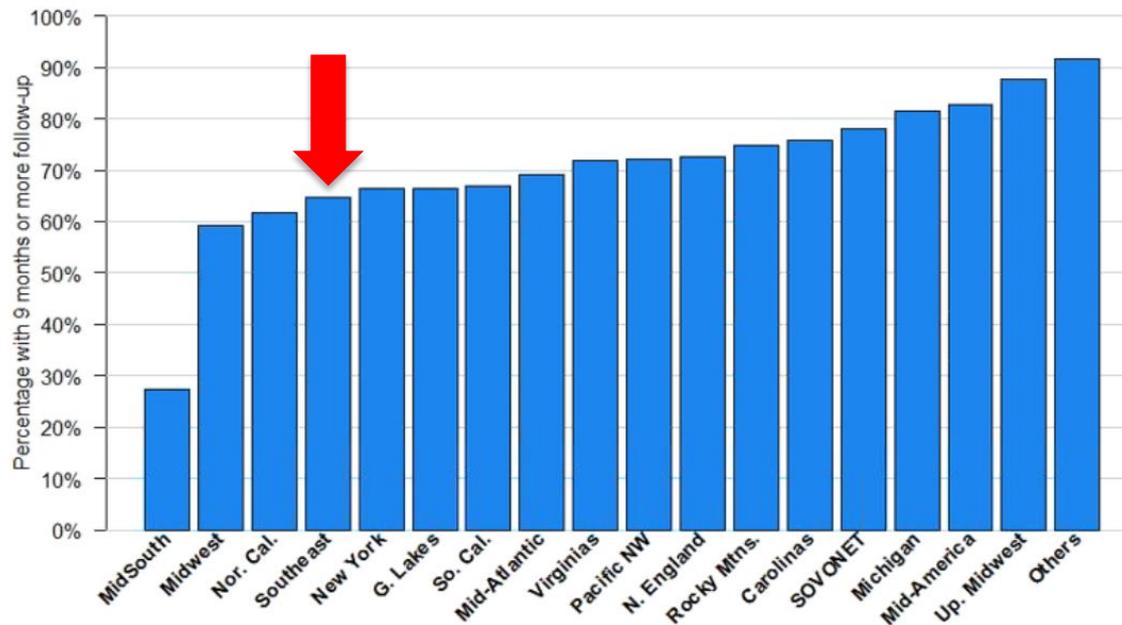
CONCLUSIONS

- EVAR patient with more comorbidities and postop complications tend to be more frequently LTF
- In-person follow up is associated with better survival
- Phone follow up confers a mortality risk similar to lack of follow up
- Surgeons should stress the importance of office visit, specially to patient with poor baseline health condition

EVAR LTFU in VQI by Region

QI Webinar Series

LTFU in EVAR by Region (2014 Cases)



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Long Term Follow Up

Consistent LTFU demonstrates commitment to quality patient care. In order to raise the LTFU rates for all VQI centers, high performing centers are eligible to receive a VQI participation award and be acknowledged in SVS/PSO publications.

Below are some suggestions from high-performing VQI sites on how to improve your LTFU:

- A physician champion is critical to the success of LTFU. The physician champion communicates to his/her VQI team that LTFU is essential for good patient care and improved outcomes.
- Report cards that display the center's current LTFU rate and track improvement should be provided weekly or monthly to the VQI team (see how to run a report in Appendix). Report cards might also include lists of VQI patients who are due or past due for a follow-up visit.
- Some sites have tied hospital credentialing and staff evaluations/raises to the success of achieving LTFU of 80% or greater.

A VQI site that has 100% LTFU provided these tips for improving results:

- Start reviewing electronic records at the 9-month post-procedure time point
- Send a list of patients who need a follow-up appointment to office staff
- Key is to make a follow-up appointment at the time of the surgical procedure
- If no vascular appointment will be made inside the window of 9-21 months post procedure, use another appointment (i.e. PCP, endocrine, cardiac, oncology) to collect data
- If the patient will not be returning for an appointment, call at home. Calling outside of work hours is often successful
- Call the emergency contact in the medical record, if unable to reach the patient directly
- Internet Search- patient's name and city will bring up obituaries, new addressed or other family members to contact
- Email the patient if the address is given in the medical record.
- Call the patient's place of work as a last resort.

Links to further LTFU information:

- [VQI Participation Awards 2016](#)
- [VQI Participation Awards 2015](#)
- [VQI PI re LTFU Exclusions](#)

VQI Monthly and Annual Updates

[VQI Summary Slides - March](#)

[VQI Participating Sites - March](#)

[VQI Pulse e-Newsletter Vol. 9](#)

[2016 VQI Annual Report](#)

[2016 VQI Detailed Annual Report](#)

News

[Matt Austin, PhD, faculty member at Johns Hopkins Univ. School of Medicine, to speak at VQI@VAM 2017](#)

Posted: 04/25/2017 9:21 PM

[VQI@VAM 2017: See the Full Speaker Listing and Detailed Agenda](#)

Posted: 04/22/2017 1:41 AM

[Read the new VQI Pulse Vol. 9 - VQI@VAM Agenda and National QI Webinars](#)

Posted: 04/10/2017 1:00 PM

The VQI has allowed us to look at the process of care for the vascular patient in a much more granular way. It is user friendly and captures better than any quality driven database the variables we need to be looking at as vascular surgeons to improve our quality of care.

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Vascular Quality Initiative and National Surgical Quality Improvement Program registries capture different populations and outcomes in open infrainguinal bypass

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- Surgical registries have become widespread
- Advantages: improves in outcomes, satisfy quality metrics, access to multi-institutional real-world data for benchmarking and research
- VQI record consecutive patients, NSQIP uses a sample of cases
- Objective of this study was to compare populations and outcomes from both databases

- Retrospective comparison of demographic, clinical and outcome variables between databases
- VQI: 1-year follow up data, 100% eligible patients, >360 centers – Data included from 2011-2015
- NSQIP targeted: 30 days data, Quasi-random sample, >80 centers – Data included from 2011-2013
- Elective lower extremity open procedures
- Standardized definitions created between databases
- 1:1 Propensity matching

- NSQIP has a intra-database reliability of 92% for wound infection ($K=.56$), 99% for stroke or MI ($K=0.85$) and 83% percent for bleeding ($K=0.52$)
- Patients in VQI were younger, slightly higher BMI, recent smokers and higher COPD
- Poor capture of active angina and PCI in NSQIP
- NSQIP has higher rates of critical limb ischemia and rates of undocumented ABIs

RESULTS

Table I. Demographics of patients undergoing infrainguinal bypass in Vascular Quality Initiative (VQI) and National Surgical Quality Improvement Program (NSQIP) registries

	<i>Unadjusted</i>			<i>Propensity matched</i>		
	<i>NSQIP</i> (<i>n</i> = 5273)	<i>VQI</i> (<i>n</i> = 1358)	<i>P value</i>	<i>NSQIP, matched</i> (<i>n</i> = 1024)	<i>VQI</i> (<i>n</i> = 1024)	<i>P value</i>
Age, years, median (IQR)	68 (60-76)	65 (58-73)	<.001	66 (58-73)	65 (58-73)	.73
Female sex	1856 (35.2)	448 (33.0)	.13	336 (32.8)	344 (33.6)	.71
Race/ethnicity			<.001			.90
White	3817 (72.4)	1011 (74.4)		764 (74.6)	749 (73.1)	
Black	858 (16.3)	274 (20.2)		203 (19.8)	216 (21.1)	
Hispanic	200 (3.8)	16 (1.2)		11 (1.1)	11 (1.1)	
Other	398 (7.5)	57 (4.2)		46 (4.5)	48 (4.7)	
BMI, mean (SD)	27.7 (5.89)	28.3 (6.25)	.003	28.4 (6.01)	28.3 (6.31)	.69
Smoking	2158 (40.9)	620 (45.8)	.001	455 (44.4)	463 (45.2)	.72
Hypertension	4368 (82.8)	1220 (90.0)	<.001	914 (89.3)	921 (89.9)	.61
Diabetes			.006			.27
Non-IDDM	938 (17.8)	292 (21.5)		234 (22.9)	225 (22.0)	
IDDM	1416 (26.9)	350 (25.8)		281 (27.4)	255 (24.9)	
End-stage renal disease	321 (6.1)	54 (4.0)	.003	0 (0.0)	0 (0.0)	1.0
Creatinine, mean (SD)	1.39 (1.38)	1.05 (0.61)	<.001	1.08 (0.47)	1.07 (0.66)	.61
Any COPD	688 (13.0)	400 (29.5)	<.001	262 (25.6)	294 (28.7)	.11
Angina	0 (0.0)	128 (9.4)	<.001	0 (0.0)	92 (9.0)	<.001
Prior MI	1 (<0.1)	10 (0.7)	<.001	0 (0.0)	7 (0.7)	.008
Any CHF	164 (3.1)	23 (1.7)	.005	17 (1.7)	13 (1.3)	.46
Prior PCI	0 (0.0)	265 (19.5)	<.001	0 (0.0)	188 (18.4)	<.001
Preoperative aspirin	4173 (79.1)	841 (61.9)	<.001	656 (64.1)	623 (60.8)	.13
Preoperative statin	3603 (68.3)	859 (63.3)	<.001	642 (62.7)	642 (62.7)	1.00
Preoperative beta-blocker	3197 (60.6)	821 (60.5)	.91	579 (56.5)	625 (61.0)	.039
Prior ipsilateral intervention	2121 (40.2)	509 (37.5)	.068	373 (36.4)	361 (35.3)	.58

BMI, Body mass index; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; IDDM, insulin-dependent diabetes mellitus; IQR, interquartile range; MI, myocardial infarction; PCI, percutaneous coronary intervention; SD, standard deviation.

Values are reported as number (%) unless otherwise indicated.

RESULTS

Table II. Procedural details of patients undergoing infrainguinal bypass in Vascular Quality Initiative (VQI) and National Surgical Quality Improvement Program (NSQIP) registries

	Unadjusted			Propensity matched		
	NSQIP (n = 5273)	VQI (n = 1358)	P value	NSQIP, matched (n = 1024)	VQI (n = 1024)	P value
Indication			<.001			.87
Asymptomatic	137 (2.6)	59 (4.4)		51 (5.0)	58 (5.7)	
Claudication	1484 (28.1)	366 (27.0)		350 (34.2)	359 (35.1)	
CLI, rest pain	1581 (30.0)	282 (20.8)		265 (25.9)	269 (26.3)	
CLI, tissue loss	2009 (38.1)	364 (26.9)		345 (33.7)	327 (31.9)	
Acute limb ischemia	0 (0.0)	272 (20.1)		0 (0.0)	0 (0.0)	
Other	62 (1.2)	12 (0.9)		13 (1.3)	11 (1.1)	
ABI			<.001			.77
0.90-1.29	151 (2.9)	74 (5.4)		54 (5.3)	65 (6.3)	
0.40-0.89	1647 (31.2)	548 (40.4)		464 (45.3)	464 (45.3)	
≤0.39	873 (16.6)	422 (31.1)		279 (27.2)	284 (27.7)	
≥1.30	150 (2.8)	41 (3.0)		30 (2.9)	25 (2.4)	
None/not documented	2452 (46.5)	273 (20.1)		197 (19.2)	186 (18.2)	
Procedure			<.001			.60
Femoral-popliteal with single SVG	1679 (31.8)	298 (21.9)		262 (25.6)	243 (23.7)	
Femoral-popliteal with graft or spliced vein	1380 (26.2)	342 (25.2)		268 (26.2)	274 (26.8)	
Femoral-distal with single SVG	969 (18.4)	237 (17.5)		179 (17.5)	159 (15.5)	
Femoral-distal with graft or spliced vein	548 (10.4)	197 (14.5)		115 (11.2)	132 (12.9)	
Popliteal-distal with single SVG	353 (6.7)	141 (10.4)		90 (8.8)	103 (10.1)	
Popliteal-distal with graft or spliced vein	134 (2.5)	36 (2.7)		29 (2.8)	25 (2.4)	
Other	210 (4.0)	107 (7.9)		81 (7.9)	88 (8.6)	
ASA class			<.001			.91
1	19 (0.4)	13 (1.0)		8 (0.8)	9 (0.9)	
2	245 (4.7)	57 (4.2)		43 (4.2)	49 (4.8)	
3	3867 (73.4)	896 (66.3)		746 (72.9)	727 (71.0)	
4	1132 (21.5)	383 (28.3)		226 (22.1)	238 (23.2)	
5	5 (0.1)	3 (0.2)		1 (0.1)	1 (0.1)	
Emergent	204 (5.6)	62 (4.6)	.14	0 (0.0)	0 (0.0)	1.0
Procedure time, minutes, median (IQR)	224 (168-297)	216 (162-275)	<.001	230 (169-305)	211 (156-270)	<.001
Discharge status			<.001			.23
Home	3685 (69.9)	1038 (76.4)		783 (76.5)	822 (80.3)	
Rehabilitation	548 (10.4)	98 (7.2)		88 (8.6)	66 (6.4)	
Nursing home	913 (17.3)	186 (13.7)		137 (13.4)	118 (11.5)	
Dead	69 (1.3)	19 (1.4)		6 (0.6)	6 (0.6)	
Other hospital	51 (1.0)	17 (1.3)		9 (0.9)	12 (1.2)	
Unknown	7 (0.1)	0 (0.0)		1 (0.1)	0 (0.0)	

ABI, Ankle-brachial index; ASA, American Society of Anesthesiologists; CLI, critical limb ischemia; IQR, interquartile range; SVG, saphenous vein graft. Values are reported as number (%) unless otherwise indicated.

Table III. Unadjusted and adjusted outcomes of infrainguinal bypass in Vascular Quality Initiative (VQI) and National Surgical Quality Improvement Program (NSQIP) registries

Outcome	Unadjusted			Propensity matched				
	NSQIP (n = 5273)	VQI (n = 1358)	P value	NSQIP-PT (n = 1024)	NSQIP PUF (n = 1024)	NSQIP in-hospital (n = 1024)	VQI (n = 1024)	P value ^a
Thirty-day mortality	93 (1.8)	27 (2.0)	.58	—	10 (1.0)	—	12 (1.2)	.67
Any MI or stroke	171 (3.2)	53 (3.9)	.22	31 (3.0)	30 (2.9)	24 (2.3)	34 (3.3)	.70
Return to OR	847 (16.1)	156 (11.5)	<.001	—	131 (12.9)	70 (6.8)	88 (8.6)	.002
Bleeding	905 (17.2)	496 (36.5)	<.001	138 (13.5)	206 (20.1) ^b	206 (20.1) ^b	330 (32.2)	<.001
Major amputation	101 (3.3)	22 (1.6)	.002	12 (2.0)	—	—	9 (0.9)	.047
Wound infection	674 (12.8)	19 (1.4)	<.001	136 (13.3)	90 (8.8) ^b	16 (1.6)	9 (0.9)	<.001
Occlusion	107 (2.0)	22 (1.6)	.33	25 (2.4)	—	14 (1.4)	9 (0.9)	.006

MI, Myocardial infarction; OR, operating room; PT, procedure targeted; PUF, public use file.

Values are reported as number (%).

^aComparison between VQI and NSQIP-PT.

^bComparison with VQI is significant ($P < .05$).

RESULTS

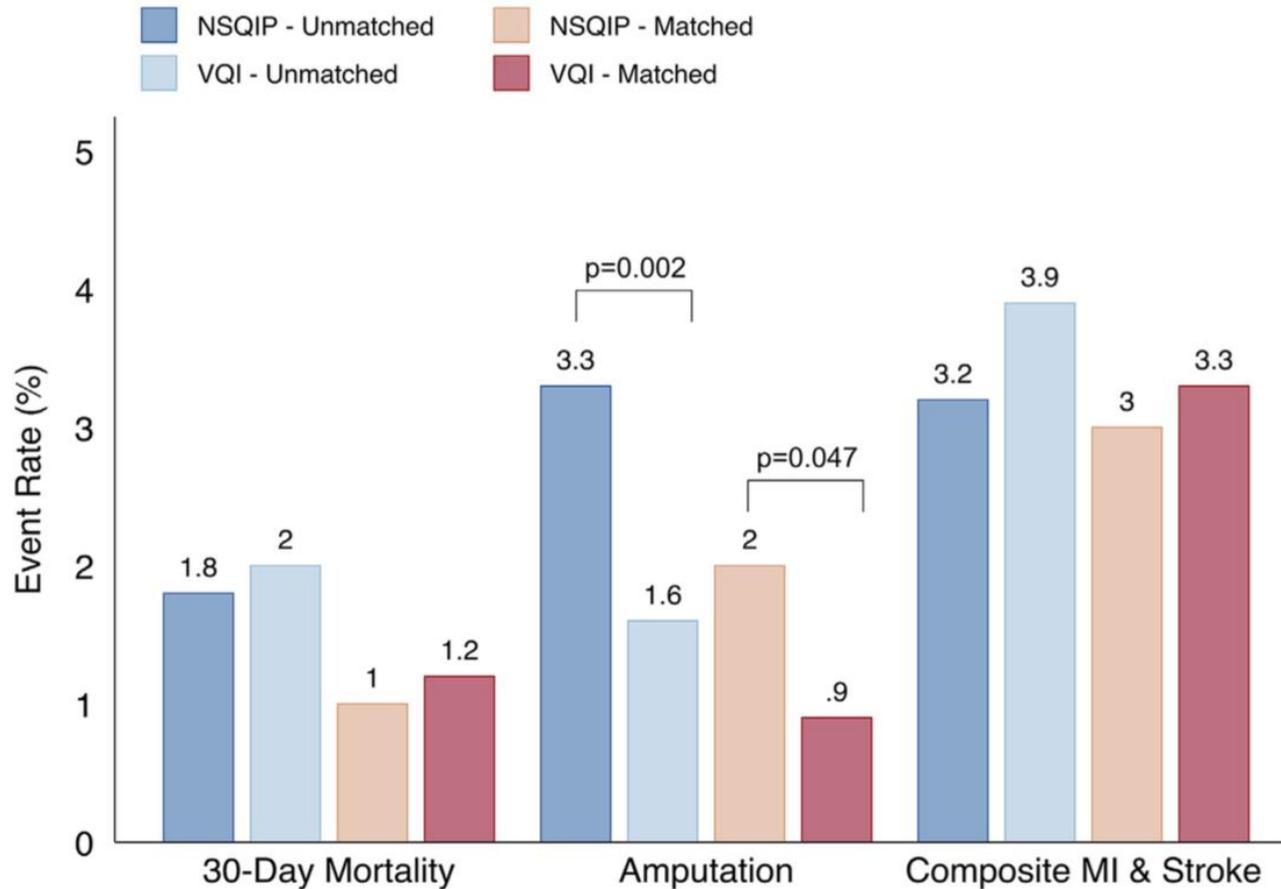


Fig 1. Rates of 30-day mortality, amputation, and composite myocardial infarction (*MI*) and stroke. *NSQIP*, National Surgical Quality Improvement Program; *VQI*, Vascular Quality Initiative.

RESULTS

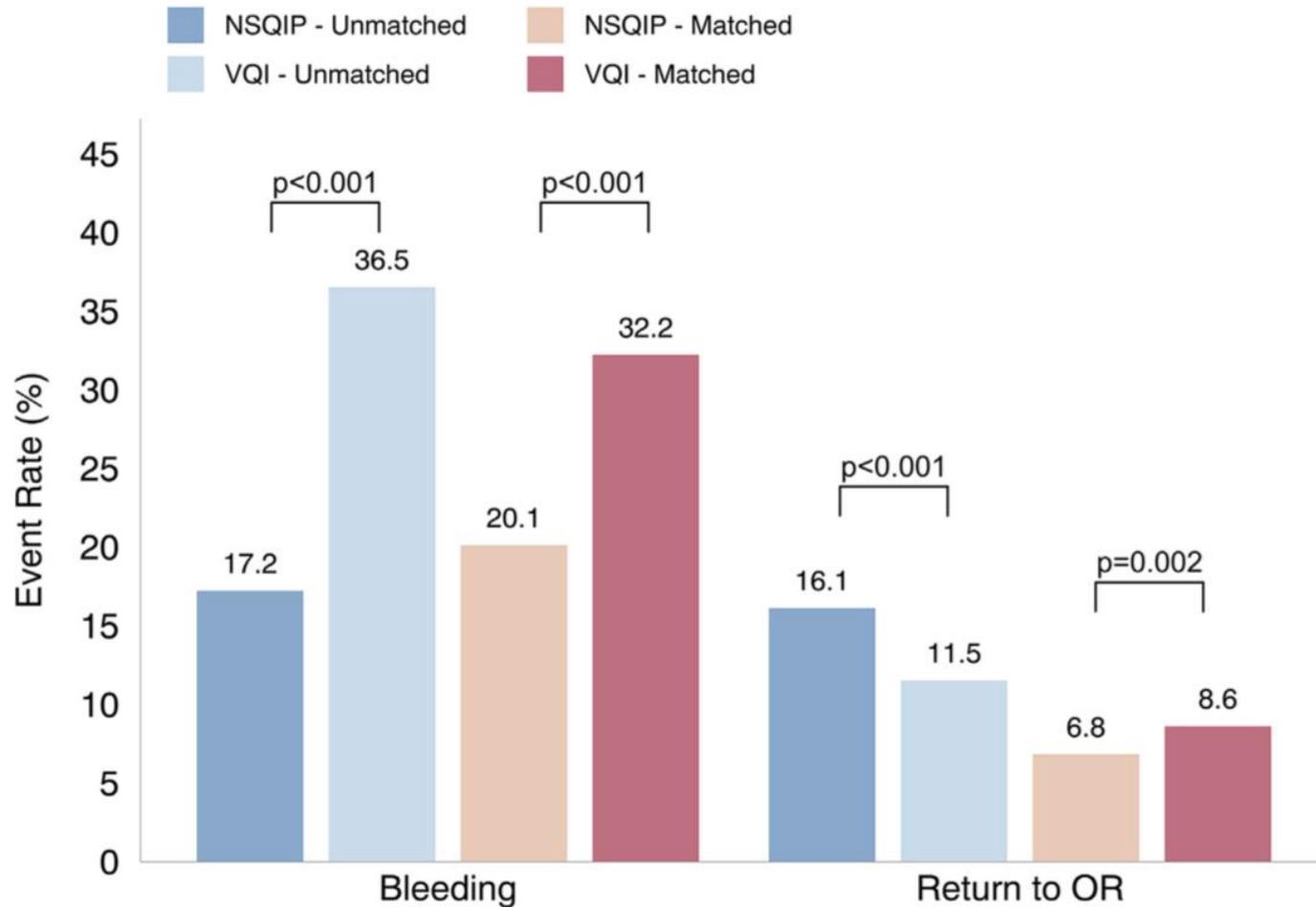


Fig 2. Rates of return to the operating room (OR) and bleeding in unadjusted and adjusted analyses. *NSQIP*, National Surgical Quality Improvement Program; *VQI*, Vascular Quality Initiative.

LIMITATIONS

- Selection bias
- Unable to identify if data is duplicative or represent difference populations
- Not nationally representative
- Complications are captured on different time scales
- Definitions are different (CHF, wound infection)

- There are differences between databases
- None is perfect and each has pros/cons
 - Long term follow-up
 - Detailed anatomical and procedural variables
- These differences should be documented when reporting outcomes – It might be misleading to compare results between them