1-Year Outcomes of Mitral Valve-in-Valve using the SAPIEN 3 Aortic Transcatheter Heart Valve

Data from the STS/ACC/TVT Registry

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Mayra Guerrero, MD
Samir Kapadia, MD
Mackram Eleid, MD
Susheel Kodali, MD
James McCabe, MD
Amar Krishnaswamy, MD
Andrew Morse, MD
Richard Smalling, MD
Mark Reisman, MD
Michael Mack, MD
William O'Neill, MD
Vinnie Bapat, MD
Martin Leon, MD
Chet Rihal, MD
Raj Makkar, MD
Brian Whisenant, MD.

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Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

Affiliation/Financial Relationship	Company
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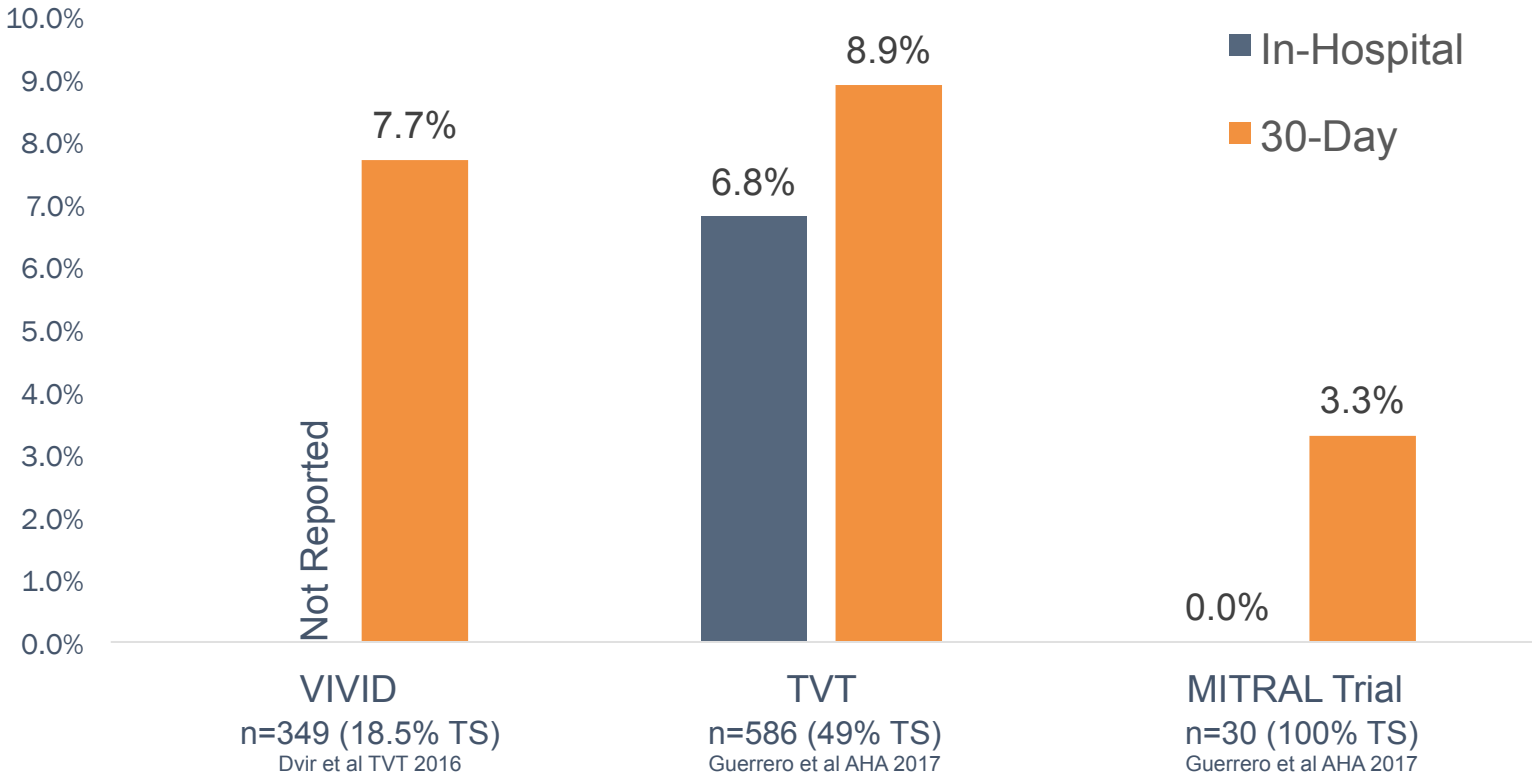
Background

The operative mortality of repeat mitral valve surgery is high

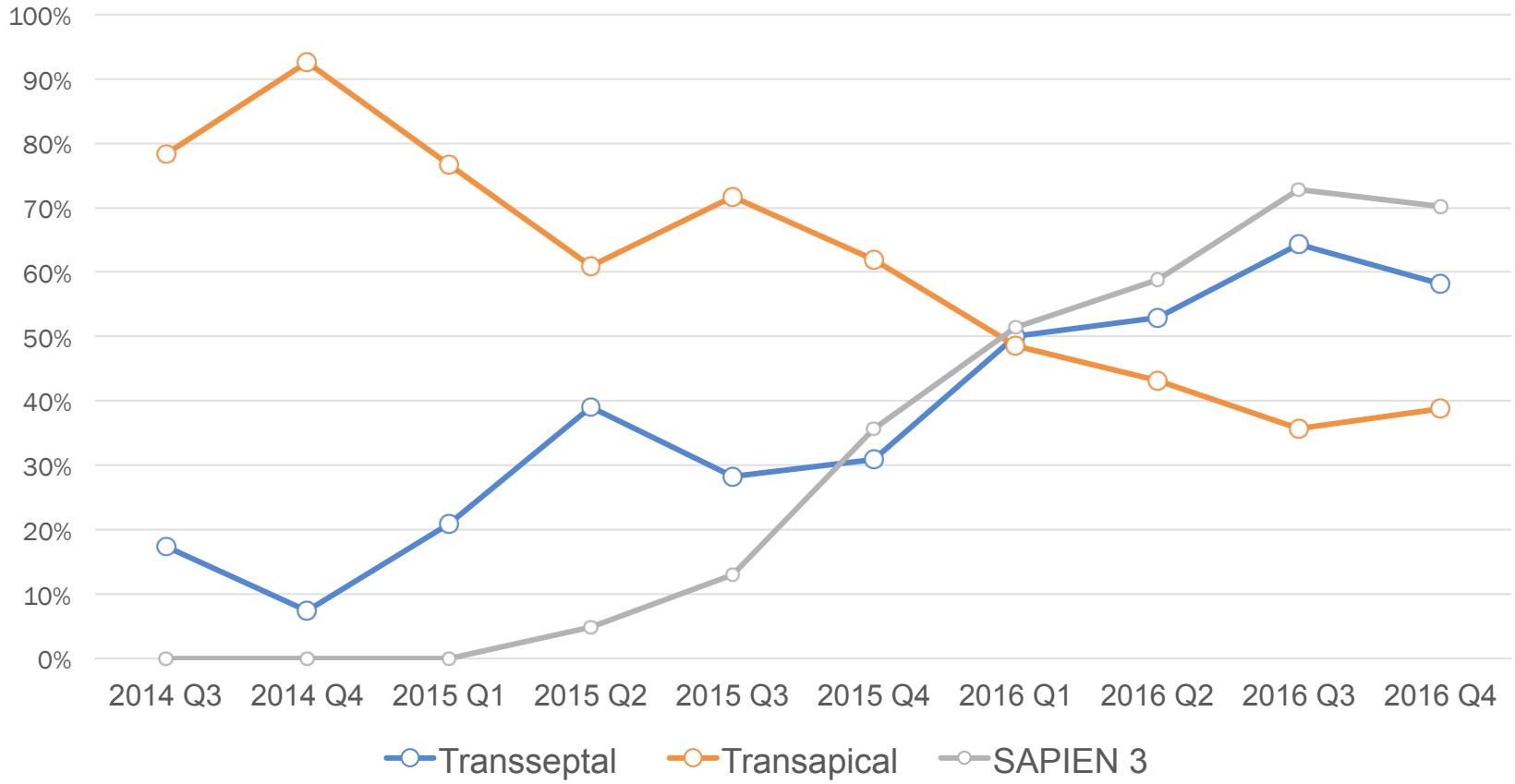
6.3% elective **17.8%** emergent 1,973 patients Vancouver CA[1]	**12.8%** 96 patients Istanbul, Turkey[2]	**11-15%** 53 patients Texas[3]	**8.2%** 182 young patients age 49.2 ± 27.4 Bursa, Turkey[4]	**12%** 48 patients Southampton, UK[5]	**12%** 1,627 patients from Medicare database[6]	**11.1%** 1,096 patients from STS database[7]

[1]Jamieson et al, Circulation 2003;108[suppl II]:II-98-II-102
[2]Albeyoglu, et al. Thorac Cardiovasc Surg 2006;54(4):244-249
[3]Toker et al, Tex Heart Inst J 2009; 26(6):557-562
[4]Ozyazicioglu et al, Turkish J Thorac Cardiovasc Surg 2012;20(3):497-502
[5]Vohra et al, Interact Cardiovasc Thorac Surg 2012 May;14(5):575-579
[6]Kwedar et al, Ann Thorac Surg 2017;104:1516-21
[7]Mehaffey et al, Heart 2018;104:652-656

30-day Mortality in Early Experience of Mitral Valve-in-Valve



Trends for Mitral Valve-in-Valve



Objectives

- Assess contemporary outcomes of MViV using SAPIEN 3
- Compare outcomes of transseptal vs transapical MViV
- Determine predictors of procedural and 1-year mortality.

Methods

- Retrospective review of data from the STS/ACC/TVT Registry linked with data from the Centers for Medicare & Medicaid Services (CMS).
- 1,576 patients underwent MViV procedure at 271 hospitals between June 2015 and August of 2019 and were enrolled in this registry.
- Patient treated under clinical trials were not included in TVT registry
- Outcomes of transseptal vs transapical procedures were compared
- Univariate and multivariate analyses were conducted to determine independent predictors of 1-year mortality.

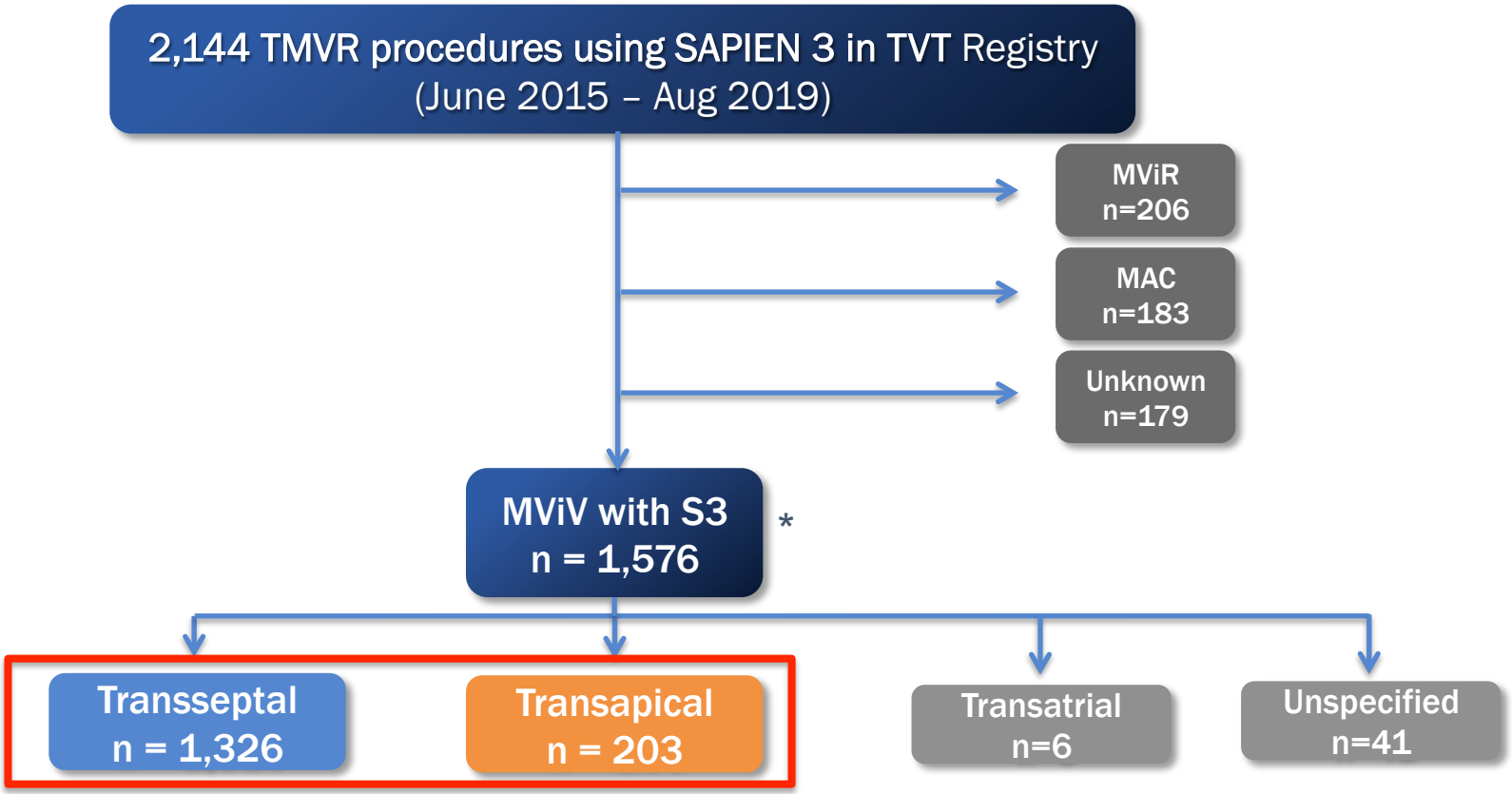
Endpoints

- Primary Safety Endpoint: Procedural Technical Success*
- Primary Effectiveness Endpoint: All-cause Mortality at 1 year.
- Secondary Endpoints:

  Procedural and In-hospital outcomes, NYHA class, Quality of Life and adverse events at 30 days and 1 year.

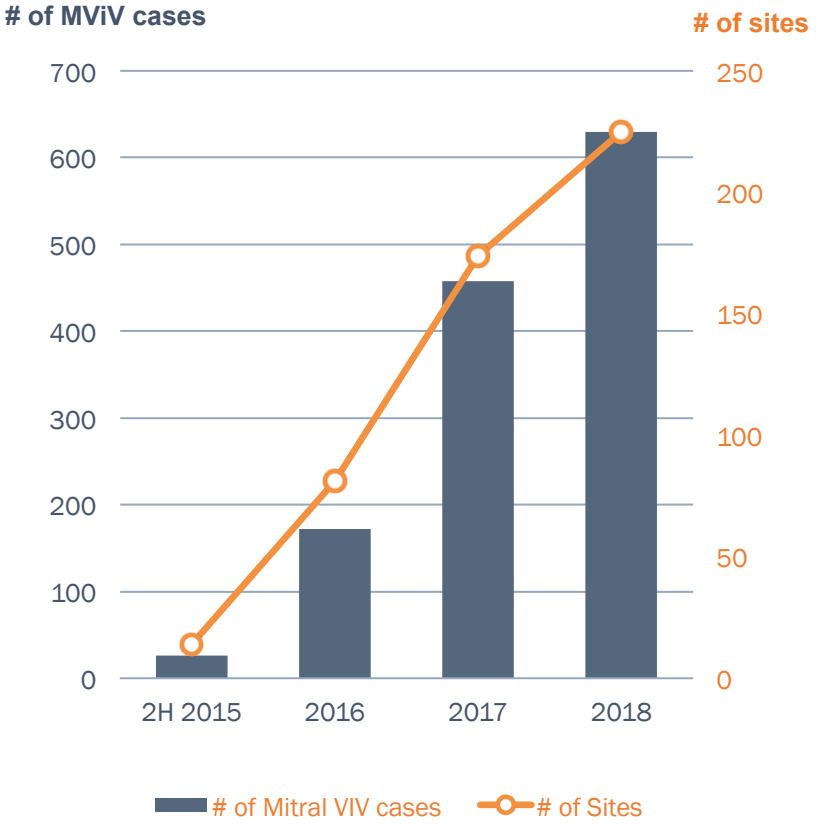
*Defined as per MVARC criteria at exit from the cath lab:
- Patient alive
- Successful access, delivery and retrieval of device delivery system,
- Successful deployment and correct position of the first intended device,
- Freedom from emergency surgery or reintervention related to the device or access procedure.

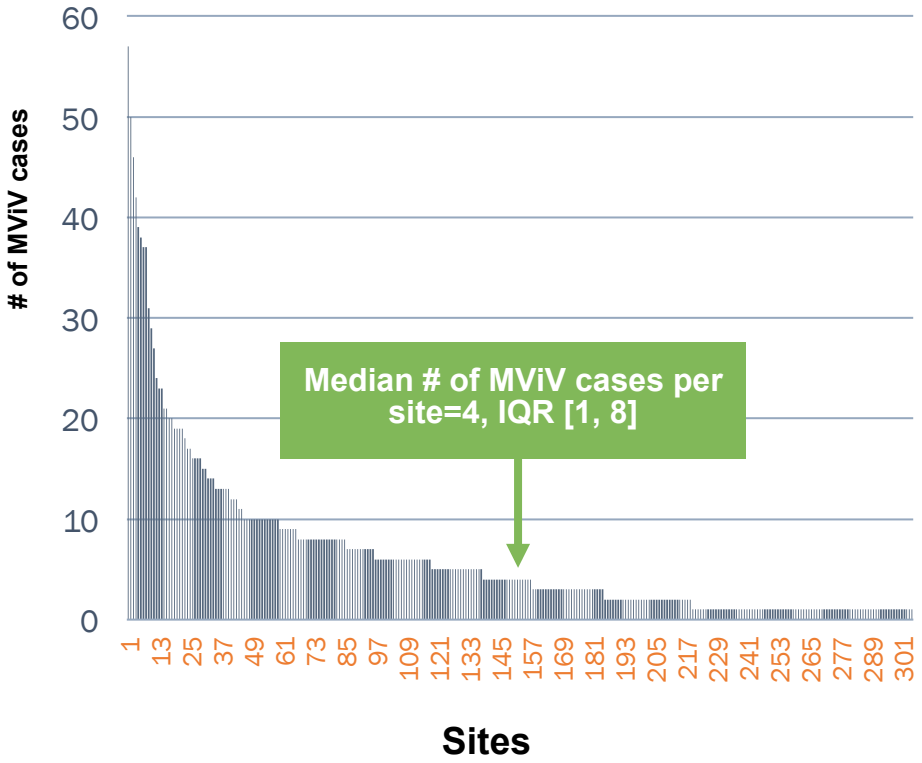
Patient Flow



*Unknown patient vital status after CMS linkage: 5.3% at 30 days and 17.1% at 1 year.

SAPIEN 3 MViV: Procedure volume growth & Cases per Site





Baseline Characteristics

n(%), or mean (±SD)	TRANSSEPTAL n=1,326	TRANSAPICAL n=203	*p* value
Age	73.4 (±11.86)	72.6 (±11.66)	0.36
Female	785 (59.2%)	119 (58.6%)	0.88
NYHA III & IV	1041 (86.5%)	184 (91.1%)	0.07
Atrial Fibrillation	952 (71.85%)	130 (64%)	0.02
Prior Stroke	232 (17.5%)	31 (15.3%)	0.45
COPD	607 (46.2%)	95 (47%)	0.82
Currently on dialysis	70 (5.3%)	12 (5.9%)	0.71
Prior CABG	442 (33.4%)	84 (41.4%)	0.03
Prior AVR	315 (23.8%)	49 (24.1%)	0.91
Hostile chest	223 (16.8%)	45 (22.2%)	0.06
STS score	11 (±8.58)	11.7 (±9.46)	0.3

Baseline Echocardiographic Characteristics

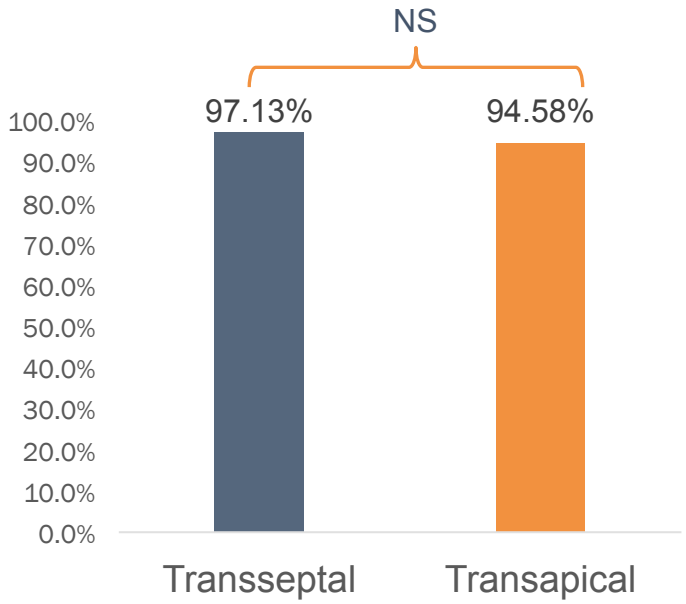
n(%), %, or mean (±SD)	TRANSSEPTAL n=1,326	TRANSAPICAL n=203	*p* value
LV Ejection fraction (%)	54.9 (±12.14)	54.1 (±11.51)	0.36
Mean MVG (mmHg)	12.6 (±5.48)	13.3 (±5.35)	0.08
Tricuspid insufficiency (mod-severe)	734 (55.6)	114/203 (56.2%)	0.88
Primary MV Pathology			
Stenosis	55.63%	53.97%	0.65
Regurgitation	24.96%	23.81%	0.79
Both MS and MR	19.41%	22.22%	0.38

Procedural Outcomes

n(%), or mean (±SD)		TRANSSEPTAL n=1,326	TRANSAPICAL n=203	*p* value
Valve Size	20 mm	3 (0.2%)	0 (0%)	1
	23 mm	101 (7.6%)	18 (8.9%)	0.54
	26 mm	553 (41.7%)	80 (39.4%)	0.54
	29 mm	669 (50.5%)	105 (51.7%)	0.74
Procedural time		125.8 (±64.3)	138.4 (±73.9)	0.02
Fluoroscopy time		37 (±25.7)	18.2 (±12.9)	<0.0001
Procedure aborted		7 (0.5%)	1 (0.5%)	1
Device Embolization		3 (0.2%)	1 (0.5%)	0.43
LVOT Obstruction		11 (0.8%)	4 (2%)	0.1
Cardiac perforation		14 (1.1%)	3 (1.5%)	0.48
Conversion to Open Surgery		9 (0.7%)	5 (2.5%)	0.03

Primary Endpoints

Primary Safety Endpoint: Technical Success*



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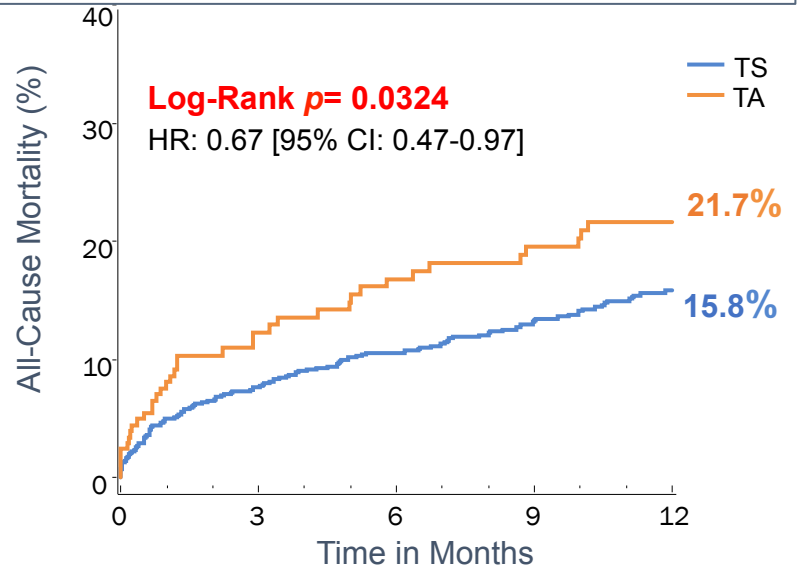
Primary Effectiveness Endpoint: All-Cause Mortality at 1 year



Number at risk:

TS	1,326	662	610	551	438
TA	203	135	125	115	97

In-Hospital Outcomes

	TRANSSEPTAL n=1,326	TRANSAPICAL n=203	*p* value
All-Cause Mortality	3.6%	6.4%	0.059
Cardiovascular Death	1.8%	4.4%	0.03
Stroke	0.7%	0.5%	1
Mitral Valve Reintervention	0.3%	0.5%	0.51
New Dialysis Requirement	1.3%	3%	0.11
New Pacemaker	1.1%	2%	0.3
Periprocedural MI	0.3%	0.5%	0.51
Device Thrombosis	0.2%	0.5%	0.35
Major Vascular Complications	1.2%	2.5%	0.18
Length of stay [IQR]	2 [1-5]	6 [3-9]	<0.0001
Discharged Home	1,094/1,326 (82.5%)	120/203 (59.1%)	<0.0001

30-Day Mortality

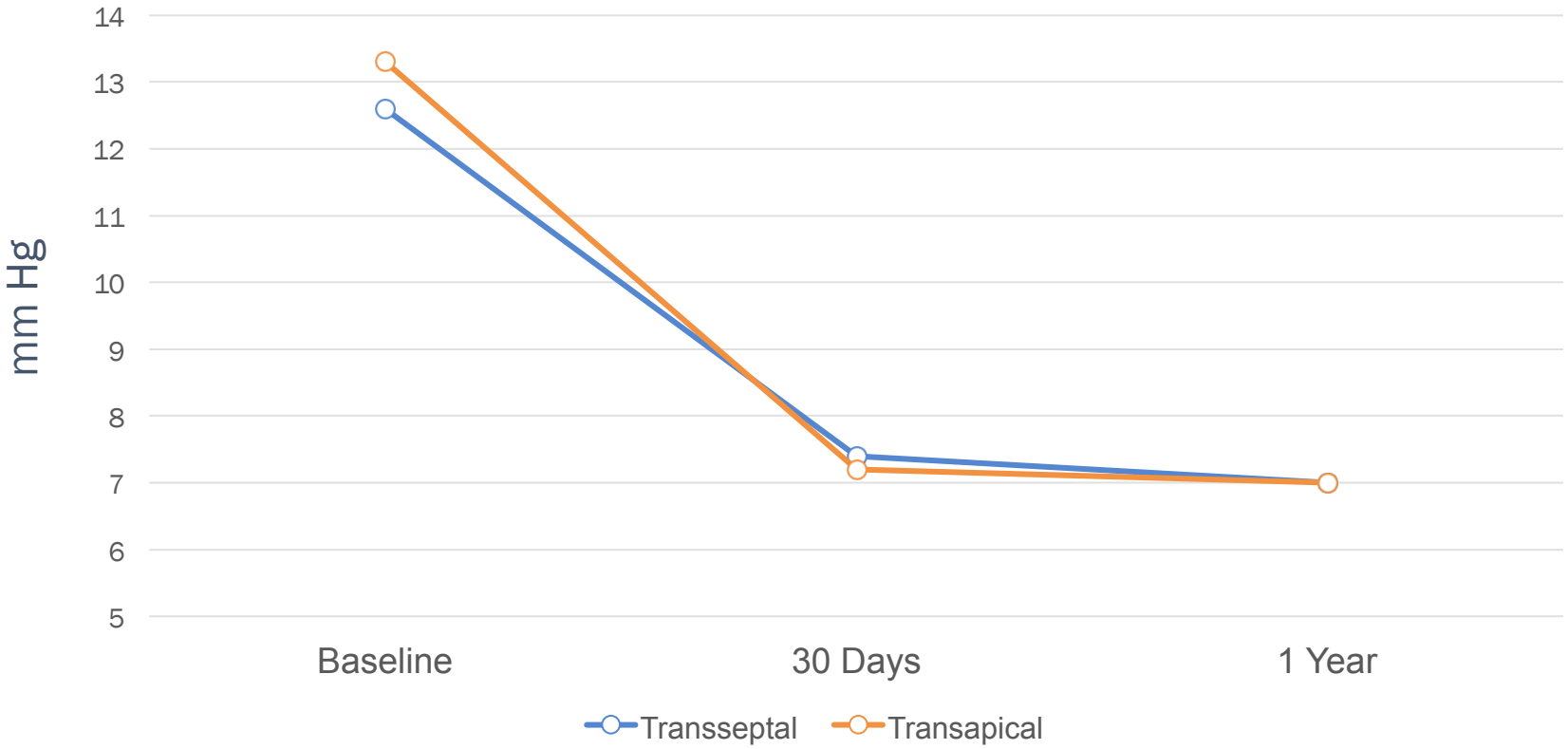
	TRANSSEPTAL n=1,326	TRANSAPICAL n=203	*p* value
All-Cause Mortality	5%	8.1%	0.07
Cardiovascular death	2.1%	5.1%	0.01
STS PROM	11%	11.7%	0.3
Observed:Expected ratio	**0.45**	**0.69**	

30-Day and 1-Year Outcomes

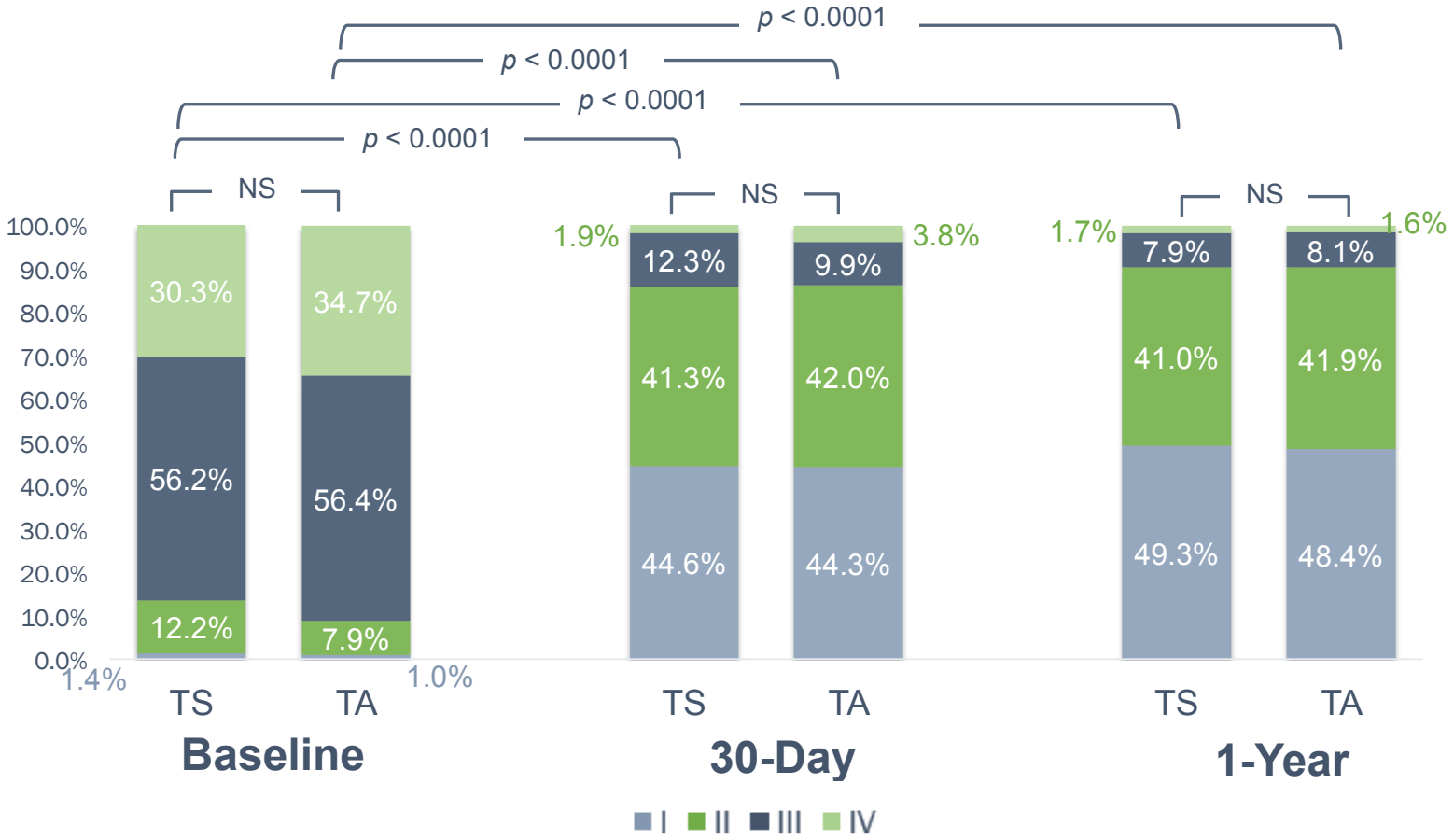
% or mean (±SD)	30-DAY TRANSSEPTAL n=1,326	30-DAY TRANSAPICAL n=203	*p* value	1-YEAR* TRANSSEPTAL n=865	1-YEAR* TRANSAPICAL n=171	*p* value
All-Cause Mortality	5%	8.1%	0.07	15.8%	21.7%	0.03
Cardiovascular death	2.1%	5.1%	0.01	3.7%	5.7%	0.07
Stroke	1.1%	1%	0.91	3.3%	3.5%	0.95
Mitral Valve Reintervention	0.4%	0.5%	0.82	0.8%	0.5%	0.78
New dialysis requirement	1.5%	3.1%	0.1	1.6%	3.1%	0.13
New Pacemaker	1.4%	2%	0.44	2%	2.8%	0.44
Device thrombosis	0.2%	0.5%	0.49	0.3%	1.2%	0.17
LV Ejection fraction	54.2 (± 11.73)	52.7 (± 12.55)	0.17	53.3 (± 11.52)	52.8 (± 13.11)	0.77
Mean MVG (mmHg)	7.4 (± 2.75)	7.2 (± 2.69)	0.5	7.0 (± 2.94)	7.0 (± 2.61)	0.99

*32.4% not due for 1 year follow up. Unknown patient vital status after CMS linkage: 5.3% at 30 days and 17.1% at 1 year.

Mean Mitral Valve Gradient



NYHA


p < 0.0001
p < 0.0001
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p < 0.0001
NS
NS
NS
100.0%
90.0%
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10.0%
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30.3%
56.2%
12.2%
1.4%
34.7%
56.4%
7.9%
1.0%
1.9%
12.3%
41.3%
44.6%
3.8%
9.9%
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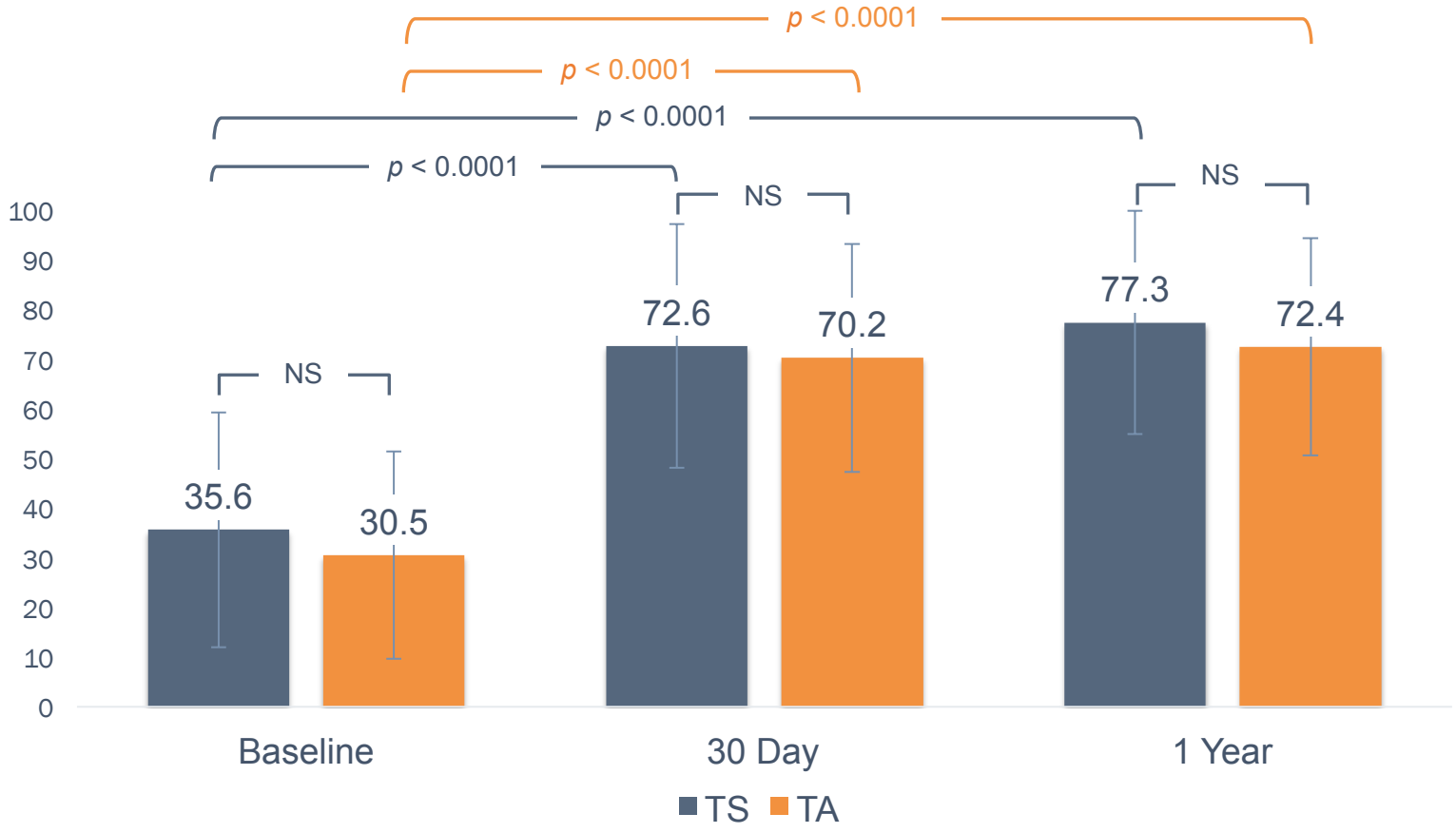
44.3%
1.7%
7.9%
41.0%
49.3%
1.6%
8.1%
41.9%
48.4%
TS
TA
TS
TA
TS
TA
Baseline
30-Day
1-Year
I
II
III
IV

KCCQ


p < 0.0001
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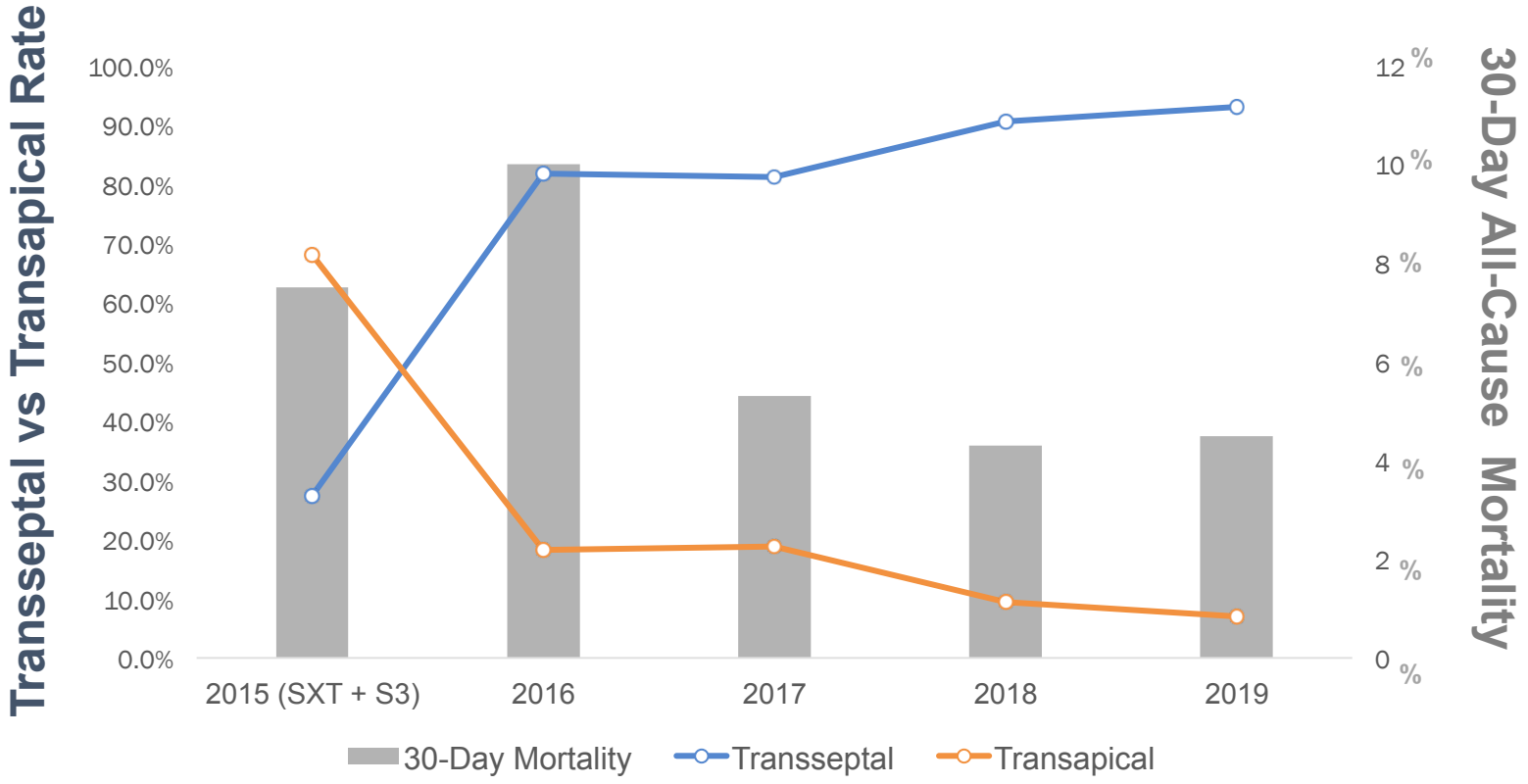
NS
NS
100
90
80
70
60
50
40
30
20
10
0
35.6
30.5
72.6
70.2
77.3
72.4
Baseline
30 Day
1 Year
TS
TA

Predictors of 1-Year All Cause Mortality

n(%), or mean (±SD)	UNIVARIATE		MULTIVARIATE	
	HR 95% CI	*p*-value	HR 95% CI	*p*-value
Baseline Covariates				
Transseptal vs Transapical	0.67 [0.47-0.97]	0.033	0.58 [0.37-0.9]	0.014
Baseline KCCQ Overall Score	0.98 [0.97-0.99]	<0.0001	0.98 [0.97-0.99]	0.002
Baseline GFR (mL/min/1.73 m^2)	0.98 [0.98-0.99]	<0.0001	0.98 [0.97-0.99]	<0.0001
Cardiogenic shock within 24 hrs	6.13 [4.18-8.98]	<0.0001	2.28 [1.14-3.03]	0.020
Mod/Sev Tricuspid Insufficiency	1.54 [1.13-2.1]	0.006	1.81 [1.16-2.84]	0.009
Procedural Covariates				
Perforation with or without tamponade	21.56 (12.19-38.15]	<0.0001	70.58 [28.51-174.7]	<0.0001
Conversion to Open Heart Surgery	9.01 [4.61-17.62]	<0.0001	3.59 [1.34-9.62]	0.010

Increase in Transseptal Access and Decrease in 30-Day Mortality



Limitations

- Non-randomized registry with site reported outcomes.
- No independent adjudication of adverse events with possible under-reporting.
- No Echo Core-Lab (true incidence of prosthesis dysfunction could be underestimated).
- This registry excludes patients in clinical trials (more complicated patients excluded from trials could have been enrolled in this registry).
- No standard definition of LVOT obstruction.

Summary

- TMVR using the SAPIEN 3 is associated with high technical success, low complication rate and 30-day mortality lower than predicted by the STS score.
- Most patients experienced significant improvement of symptoms and Quality of Life, which were maintained at 1 year.
- Valve performance was maintained at 1 year.
- Transseptal access was associated with lower mortality compared with transapical access and was an independent predictor of lower mortality at 1 year.

Conclusion

- Transcatheter MViV is preferable to redo mitral surgery and should be the standard of care for patients with failed surgical bioprosthesis who have favorable anatomy.