

Patients at intermediate surgical risk undergoing isolated interventional or surgical aortic valve replacement for severe symptomatic aortic valve stenosis. One year results from the German Aortic Valve Registry (GARY).

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on behalf of the GARY Executive Board.



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Declaration of interest

Nicolas Werner has no conflict of interest



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Background



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- Transcatheter aortic valve implantation (TAVI) is currently the recommended treatment option for patients with severe aortic valve stenosis, who are *inoperable* or at *high surgical risk*.
- PARTNER II has proven TAVI to be non-inferior compared to SAVR in terms of mid-term mortality and disabling stroke in a selected population of patients at *intermediate surgical risk* (STS Score 4-8%).
- However, RCTs usually cover selected populations and their results do not reflect a real world situation.
- Large clinical registries, like GARY, are important additional tools to gain information on the use, selection of patients, safety and efficacy of a treatment strategy, like TAVI, in a real world population today.

Objectives

Purpose of the present study

- *number of patients* at intermediate surgical risk undergoing TAVI or SAVR in Germany today
- compare *clinical characteristics and outcome* of an all-comers clinical population at intermediate surgical risk undergoing isolated TAVI or SAVR for severe aortic valve stenosis in clinical practice today

German Aortic Valve Registry (GARY)

- Supported by: German Cardiac Society (DGK), German Society for Thoracic and Cardiovascular Surgery, German Heart Foundation.
- Design:
 - prospective and multicenter registry
 - follow-up at 30d, 1-, 3- and 5-years after index procedure
 - covering 87% of all aortic valve procedures performed in Germany from 2011-2013
- Inclusion: all consecutive patients undergoing an invasive aortic valve therapy for acquired aortic valve disease (“all-comers-design”)
- Exclusion: missing informed consent

Methods / Statistics



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- **49.660** patients enrolled into GARY from Jan. 2011 until Dec. 2013 were screened
 - **22.7%** (n=11.286/49.660) → intermediate surgical risk / Log. EuroSCORE I 10-20%
 - Log. EuroSCORE I: widespread use in Europe; recommended by ESC-guidelines
 - 46.6% treated by TAVI (n=5.257/11.286), 53.4% treated by SAVR (n=6.029/11.286)

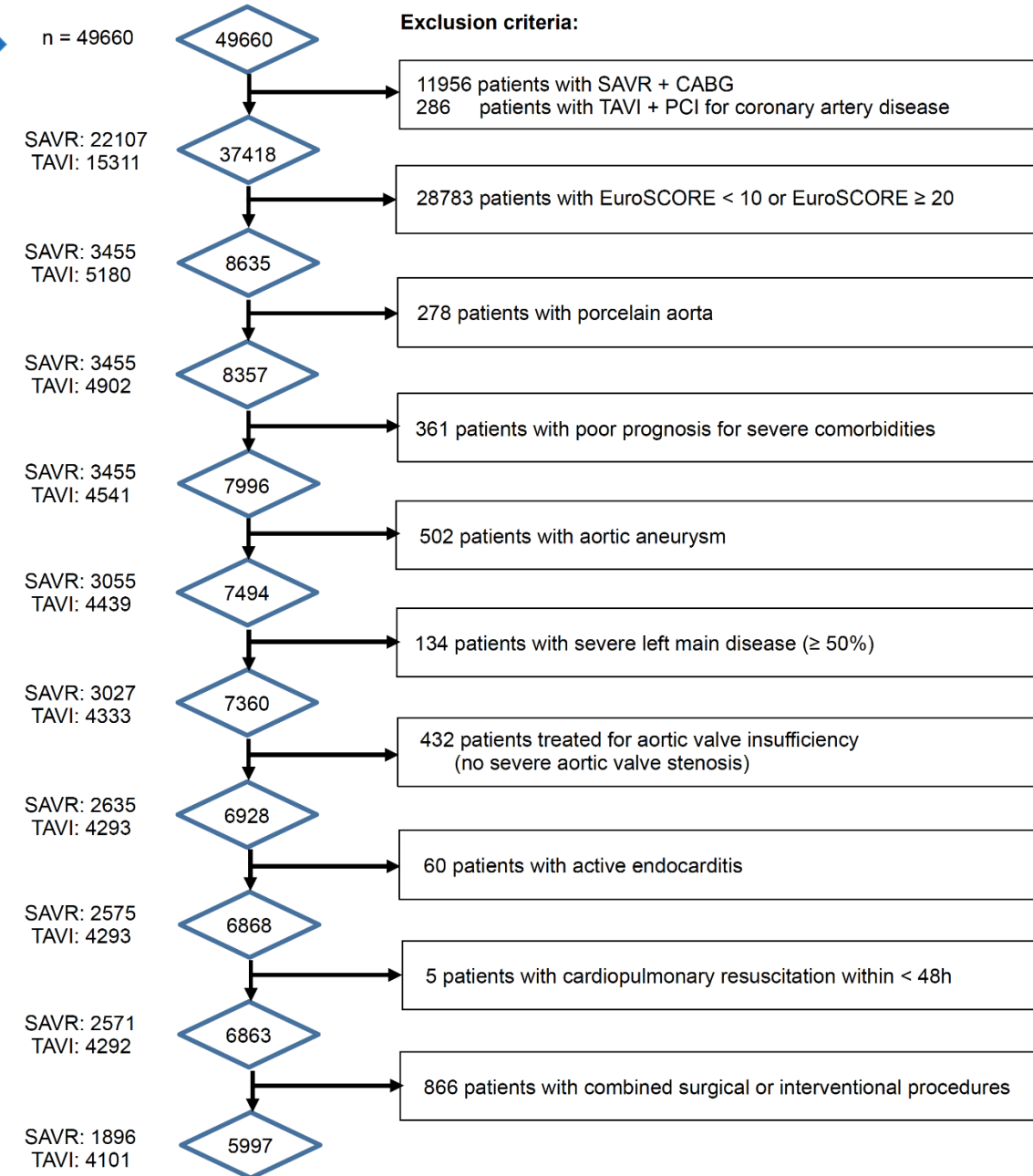
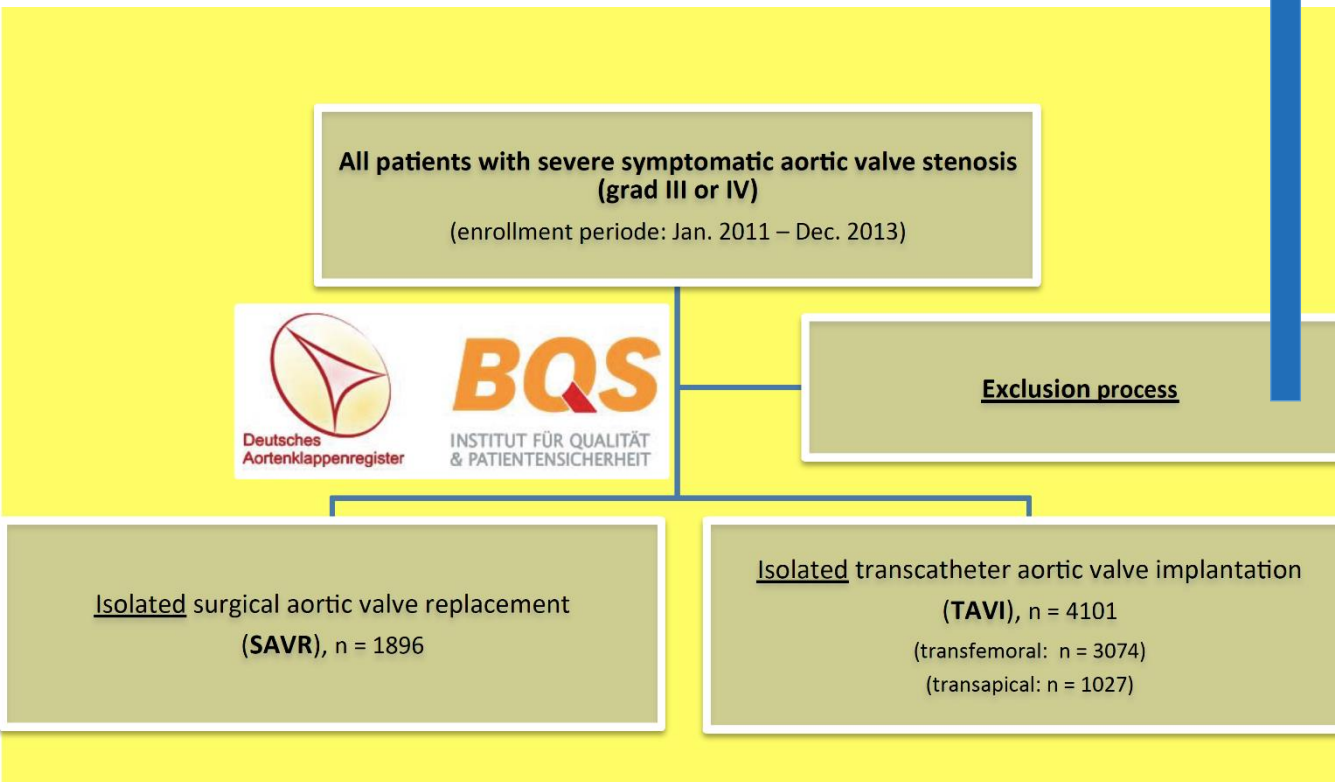
- After exclusion process:
 - **5.997** patients with isolated TAVI or SAVR were included in the underlying analysis (represent 12% of total population)

- Univariate comparison between treatment groups

- Multivariable analysis on independent clinical predictors for TAVI

- Propensity Score analysis for adjusted comparison of one-year mortality of patients treated by TAVI vs. SAVR

Patient selection schedule



Results I – Baseline characteristics



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	SAVR (n = 1896)	TAVI (n = 4101)	p-value
Age	75.9 ± 6.7	81.8 ± 5.4	< 0.001
Female	54.1%	61.6%	< 0.001
Log. EuroSCORE I	13.4 ± 2.7	14.4 ± 2.9	< 0.001
STS Score	3.7 ± 2.1	5.2 ± 2.8	< 0.001
Body mass index (BMI)	28.2 ± 4.8	27.2 ± 5.0	< 0.001
NYHA III – IV	72.4%	83.7%	< 0.001
Hypertension	87.4%	88.4%	0.282
Diabetes mellitus	31.5%	30.8%	0.602
Prior myocardial infarction	8.0%	10.5%	0.003
Mean ejection fraction (%)	54.5 ± 13.8	55.5 ± 12.2	0.094
Pulmonary hypertension	21.7%	26.6%	0.008
Previous cardiac surgery	14.4%	10.0%	< 0.001
Atrial fibrillation	20.6%	29.0%	< 0.001
Mitral regurgitation ≥ 2°	13.5%	26.0%	< 0.001
Permanent pacemaker	5.8%	10.4%	< 0.001
Creatinine > 2 mg/dl	2.5%	4.0%	0.004
Peripheral arterial vascular disease	10.4%	11.1%	0.431

Results II – Indication and procedural characteristics



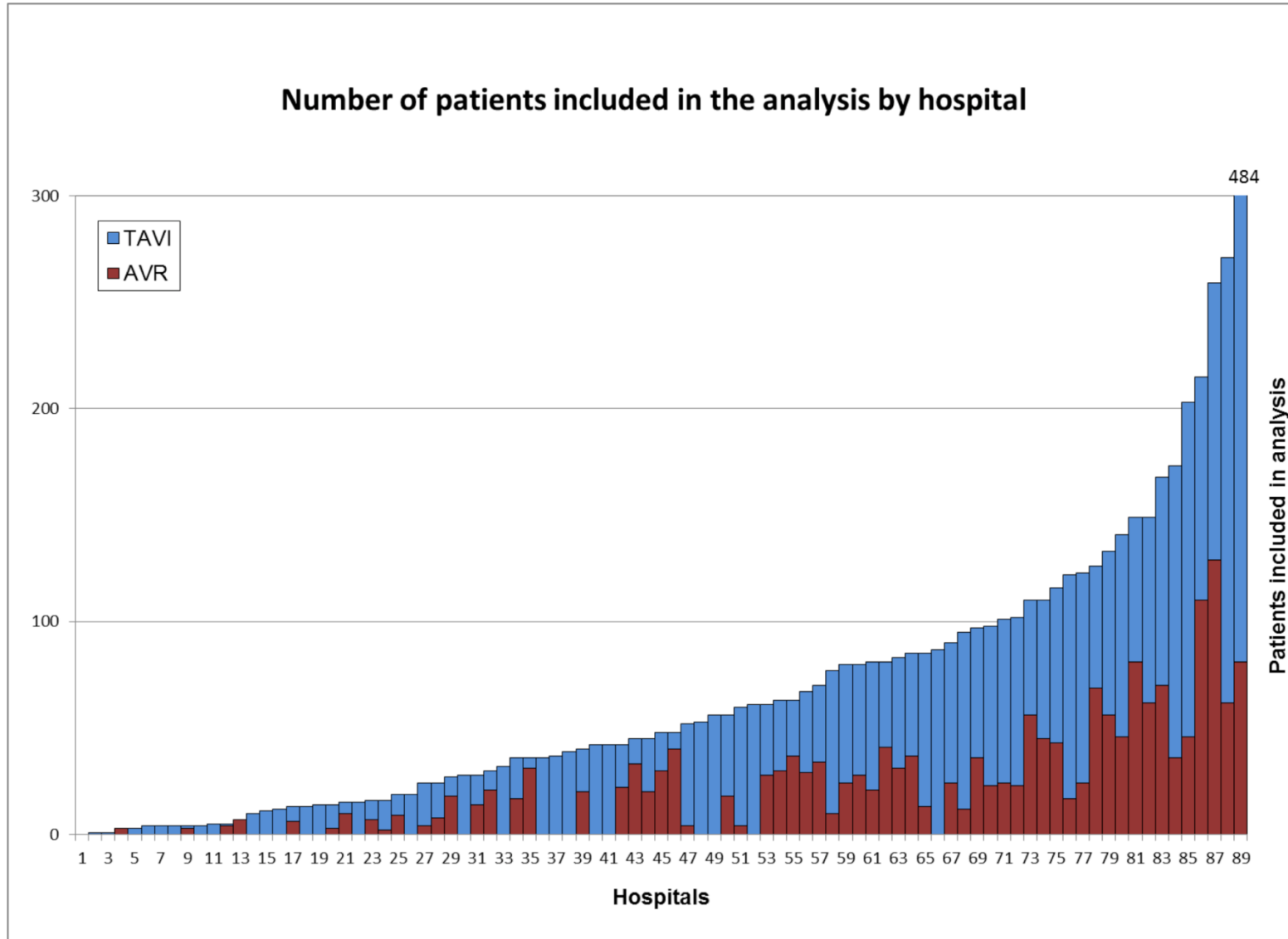
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	TAVI (n = 4101)
<u>Indication for TAVI</u>	
- Age	77.2%
- Frailty	47.3%
- Requested by patient	24.9%
- Malignoma	0.8%
- Heart Team decision	90.8%
<u>Procedural characteristics</u>	
TAVI with transfemoral access	75.0%
TAVI with transapical access	25.0%

Results – Differences between sites



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Major differences in the amount of patients treated by TAVI at intermediate surgical risk between the 88 sites

Range: 0 to 100%!

→ Large site-dependent effect

Independent predictors for TAVI



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Variable	Wald	p-value	Odds ratio	95% CI
Age (per year)	819.690	<0.001	1.23	(1.21-1.25)
Calcium Score Grade < 3	102.702	<0.001	2.07	(1.79-2.38)
Prior cardiac decompensation	83.020	<0.001	2.11	(1.80-2.49)
Coronary artery disease	71.072	<0.001	2.00	(1.70-2.35)
Pulmonary hypertension	58.940	<0.001	1.90	(1.61-2.24)
NYHA class III-IV	57.333	<0.001	1.83	(1.57-2.15)
No previous CABG	47.848	<0.001	2.22	(1.77-2.79)
Mitral valve regurgitation II-IV*	30.994	<0.001	1.67	(1.39-2.00)
Tricuspid valve regurgitation II-III*	30.917	<0.001	1.95	(1.54-2.47)
Prior PCI	15.053	<0.001	1.50	(1.22-1.84)
No peripheral arterial disease	14.849	<0.001	1.39	(1.17-1.64)
BMI < 22 (body mass index)	14.591	<0.001	1.63	(1.26-2.09)
Female gender	10.159	0.001	1.25	(1.09-1.44)

Results III – Clinical outcome



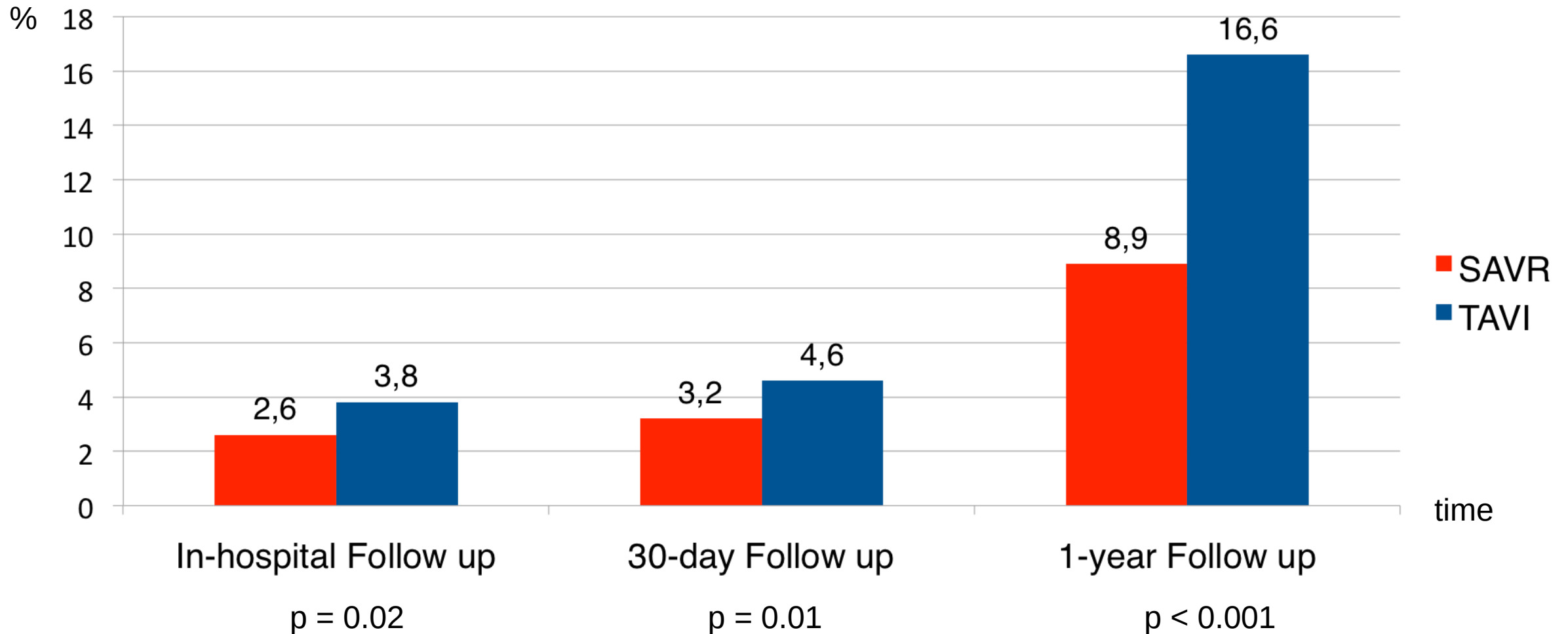
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	SAVR (n = 1896)	TAVI (n = 4101)	p-value
<u>In-hospital complications</u>			
Major / minor stroke	1.2% / 1.3%	1.5% / 1.2%	0.281/ 0.816
Myocardial infarction	0.5%	0.3%	0.114
New onset pacer / ICD	5.3%	19.1%	< 0.001
Vascular complications	1.1%	7.7%	< 0.001
Aortic valve regurgitation ≥ grade II	0.4%	4.7%	< 0.001
Conversion to open heart surgery	---	1.0%	---
Bleeding ≥ 2 RBC units	51.5%	25.0%	< 0.001
Reintervention for bleeding	4.5%	1.3%	< 0.001
Pericardial tamponade	1.1%	0.3%	< 0.001
New onset dialysis (temporary)	3.6%	2.3%	0.024

Results III – Clinical outcome (all-cause mortality)



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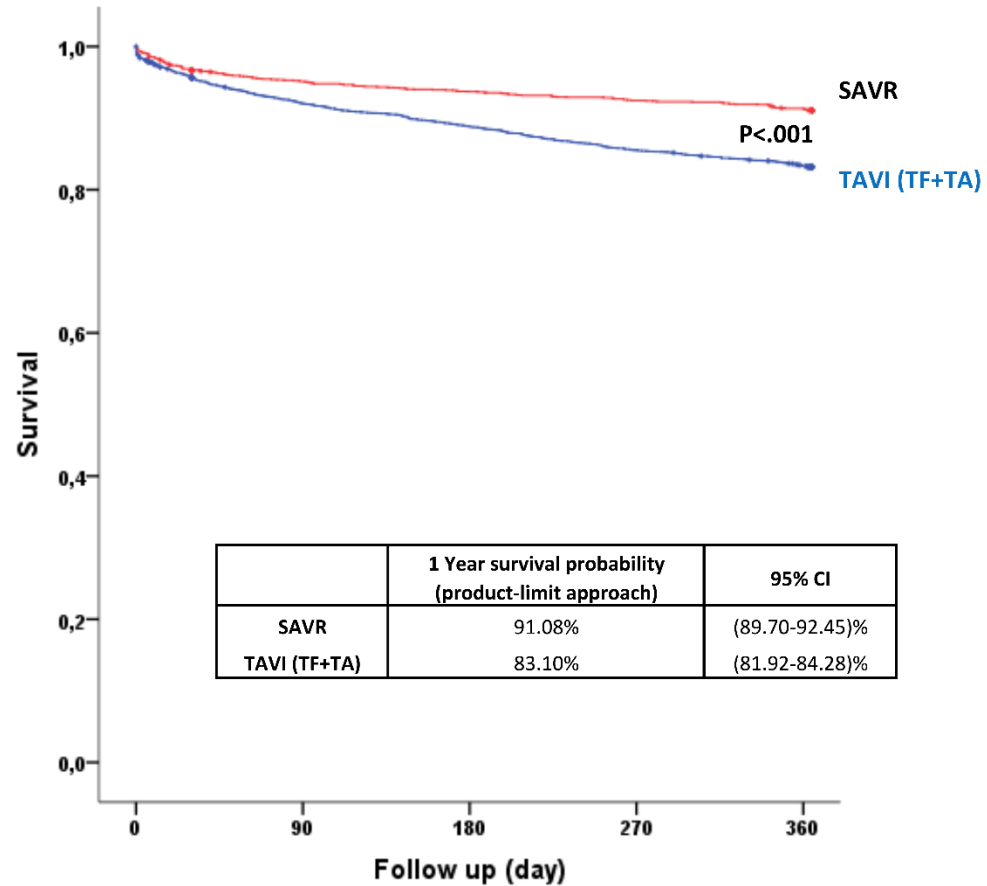


Unadjusted all-cause mortality (1-year FU)

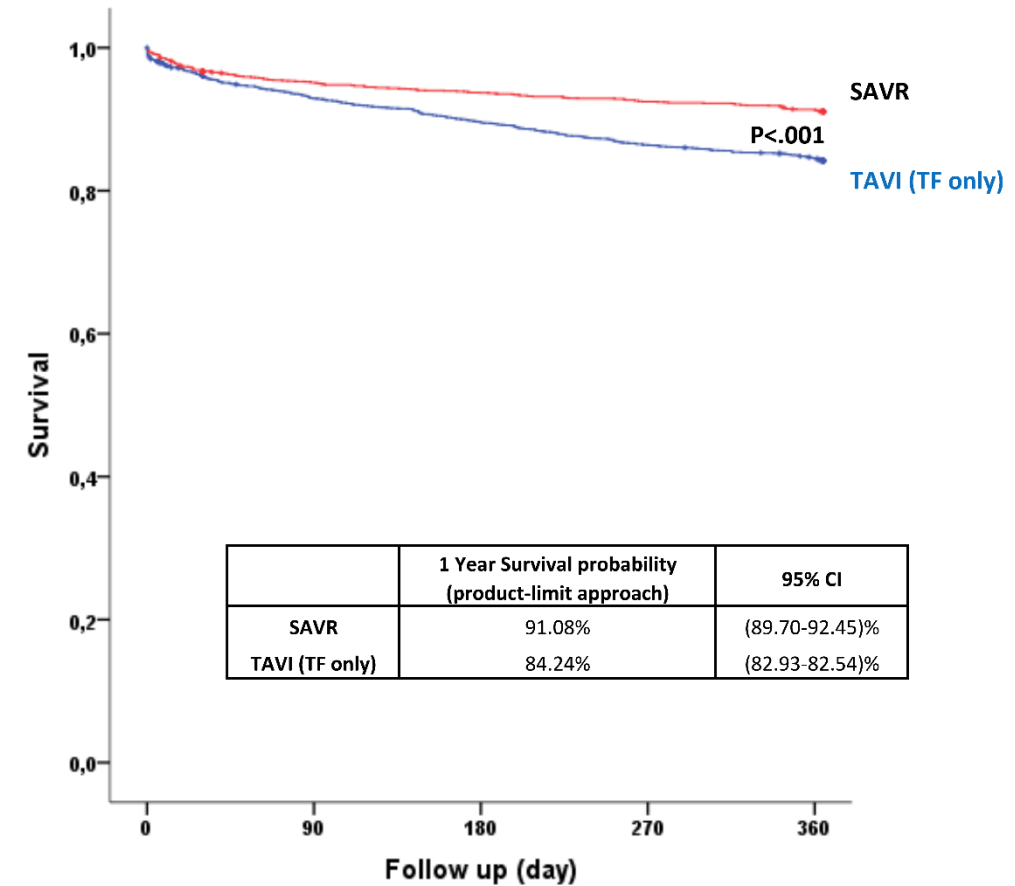
(Completeness of data: TAVI 97.5%; SAVR 98.9%)



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Pts on risk	1896	1783	1757	1734	1706
	4101	3676	3546	3415	3227



Pts on risk	1896	1783	1757	1734	1706
	3074	2776	2674	2581	2499

Propensity Score analysis



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- adjusted comparison of one-year mortality rate of patients treated by TAVI vs. SAVR
- PS calculated by using the logistic regression model
- Resulting PS → estimators of the probability receiving TAVI
- One-year mortality rates were presented for propensity score quintiles

Propensity Score analysis



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All cause one-year mortality rates for SAVR and TAVI according to propensity score quintile

SAVR vs. TAVI (transfemoral and transapical)

Stratified estimate for whole population	SAVR		TAVI		Difference; (95% CI)	p-value
	Counts (n/N)	Mortality (%)	Counts (n/N)	Mortality (%)		
Quintile 1	65/875	7.43%	14/326	12.58%	5.15%; (1.44-9.48)%	.004
Quintile 2	47/551	8.53%	77/647	11.90%	3.37%; (-0.10-6.78)%	.067
Quintile 3	33/289	11.42%	134/910	14.73%	3.31%; (-1.40-7.31)%	.158
Quintile 4	17/141	12.06%	191/1059	18.04%	5.98%; (-0.79-11.00)%	.100
Quintile 5	6/40	15.00%	236/1159	20.36%	5.36%; (-8.88-13.66)%	.379
Stratified estimate		10.89%		15.52%	4.63%; (1.75-7.52)%	.002

Propensity Score analysis



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All cause one-year mortality rates for SAVR and TAVI according to propensity score quintile

SAVR vs. TAVI (transfemoral, only)

	SAVR		TAVI (transfemoral only)		Difference; (95% CI)	p-value
	Counts (n/N)	Mortality (%)	Counts (n/N)	Mortality (%)		
Quintile 1	65/875	7.43%	25/218	11.47%	4.04% (-0.03-9.19)%	.043
Quintile 2	47/551	8.53%	56/471	11.89%	3.36% (-0.35-7.19)%	.088
Quintile 3	33/289	11.42%	86/661	13.01%	1.59% (-3.21-5.81)%	.489
Quintile 4	17/141	12.06%	130/769	16.91%	4.85% (-2.02-10.06)%	.182
Quintile 5	6/40	15.00%	177/955	18.53%	3.53% (-10.73-11.88)%	.533
Stratified estimate		10.78%		14.26%	3.48%; (0.53-6.43)%	.021

Limitations

- Risk of unmeasured confounding (“frailty” only documented in TAVI-group in GARY)
- Risk stratification of a patient → solely by using Log. EuroSCORE I
- All available risk scores are known to be inaccurate (especially in a TAVI population)
- Not possible to adjust for the “Medical opinion” of a Heart Team
(also based on subjective factors of a patient’s clinical condition)
- Major differences in the number of patients treated at intermediate surgical risk between the sites
→ local aspects might have influenced the patient selection to TAVI or SAVR
- Clinical variables of inoperability (f.i. FEV1) of a patient not recorded in GARY (except porcelain aorta)
→ some inoperable patients might have been included in the TAVI-group with a worse clinical outcome

Conclusion



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- A relevant proportion of patients at intermediate surgical risk were treated with TAVI in Germany from 2011 until 2013.
- Patients undergoing TAVI → significantly different with regard to age, gender and risk score → marked selection bias in clinical reality (TAVI patients being at higher risk)
- Intermediate surgical risk patients undergoing isolated TAVI in a real-world scenario have a low in-hospital mortality rate (< 4%).
- Even after propensity score analysis a significant difference in one-year mortality rate persisted between SAVR and TAVI → most probably caused by additional confounders.
- PARTNER II: non-inferiority of TAVI compared to SAVR in a selected intermediate-risk population.
- GARY: showed clinical reality and a reasonable selection of patients in everyday clinical practice.



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Thank you for your attention!

Thank you to all the participating sites in GARY!

