Pacemaker Post-TAVR: Evaluation of Clinical Outcomes and the Impact of Implantation Timing

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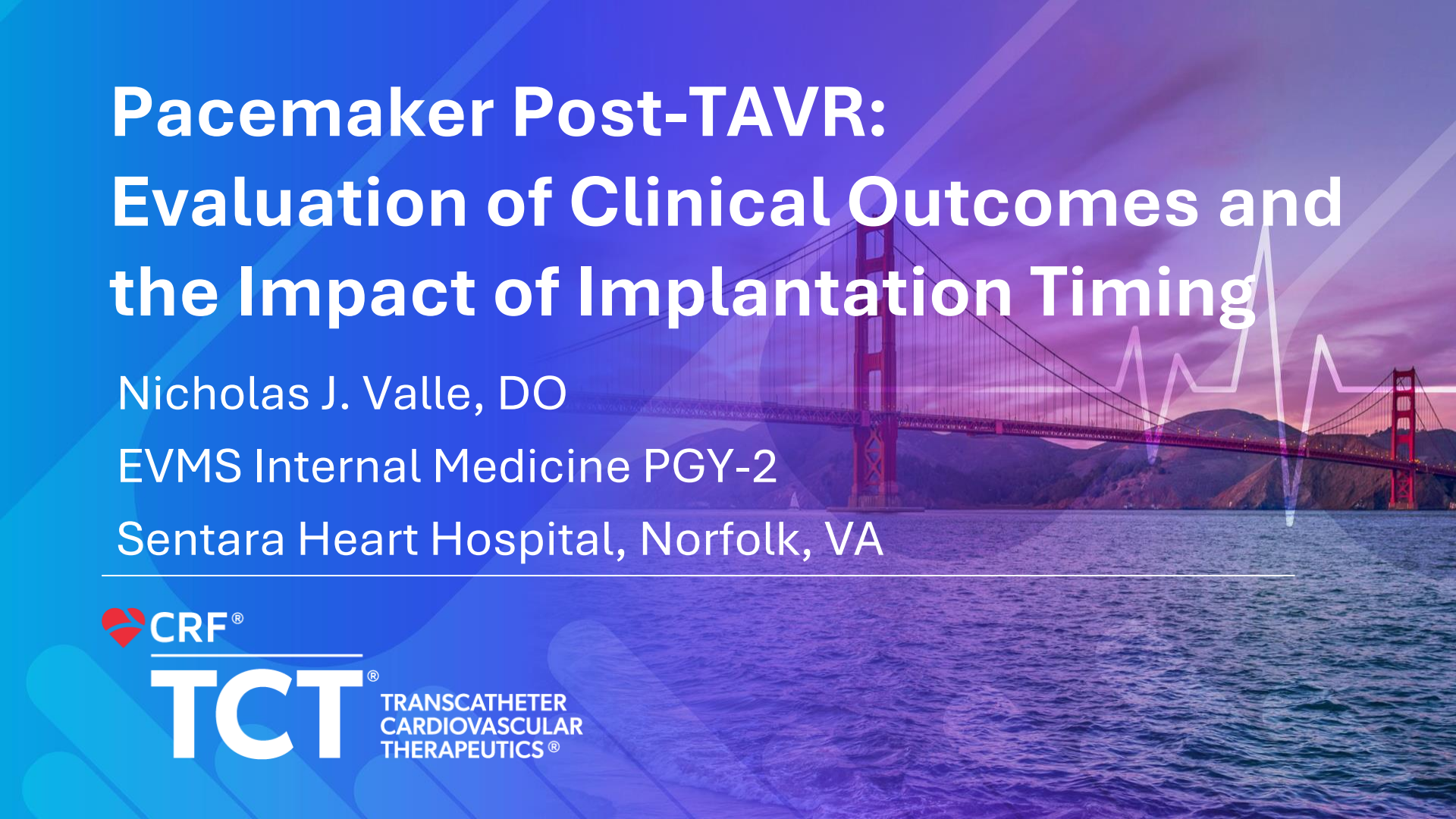

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Disclosure of Relevant Financial Relationships

I, **Nicholas J. Valle,** DO NOT have any financial relationships to disclose.

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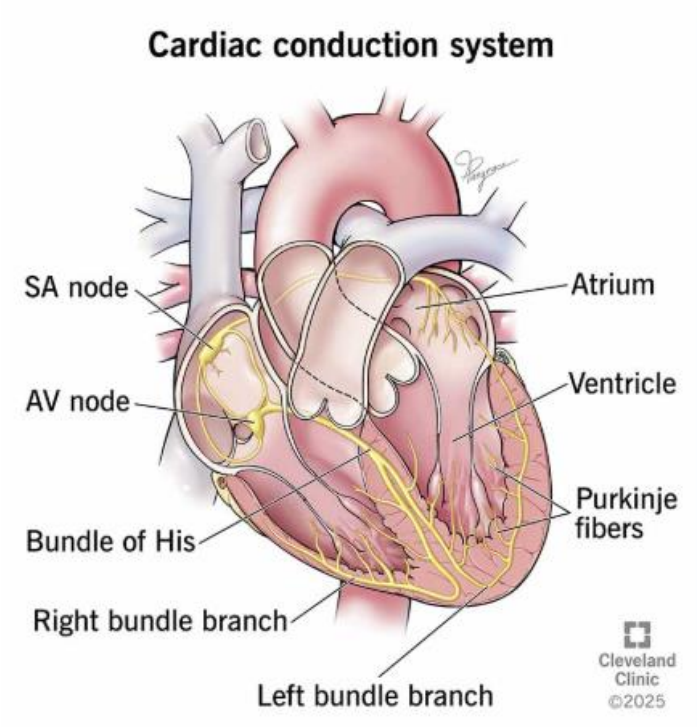
Background

- Radial force of valve expansion during TAVR leads to compression of the membranous septum, which may injure conduction system anatomy
- Depending on degree of resultant pathology, permanent pacemaker (PPM) implantation may be required



How Common is PPM Post-TAVR?

- Varies by:
  - Institution
  - Valve Type (SEV vs BEV)
  - Procedural factors (implant depth)
  - Patient factors (pre-existing conduction disease/a-fib)
  - Era
- ACC 2020 Consensus: approx. 15% of Post-TAVR patients receive PPM

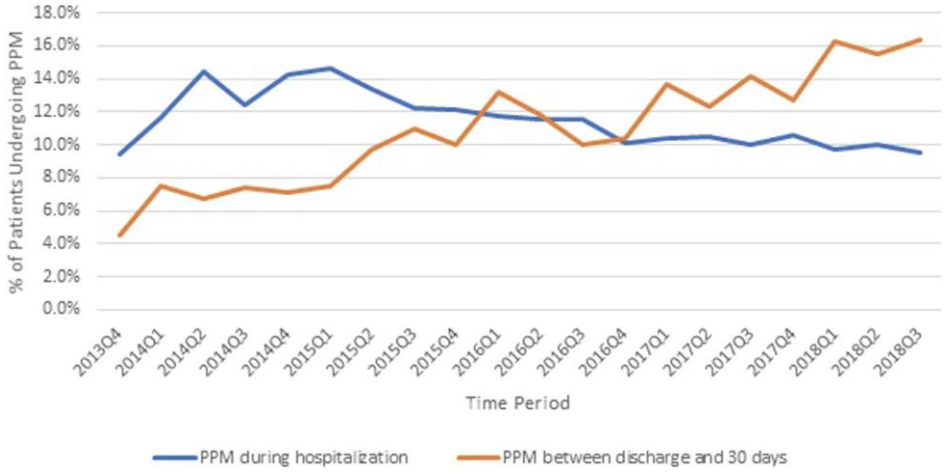


Figure 1. Incidence of post-TAVR PPM placement between 2013-2018

Lilly et al. *JACC.* 2020;76 (20):2391-2411

Is PPM Post-TAVR Bad?

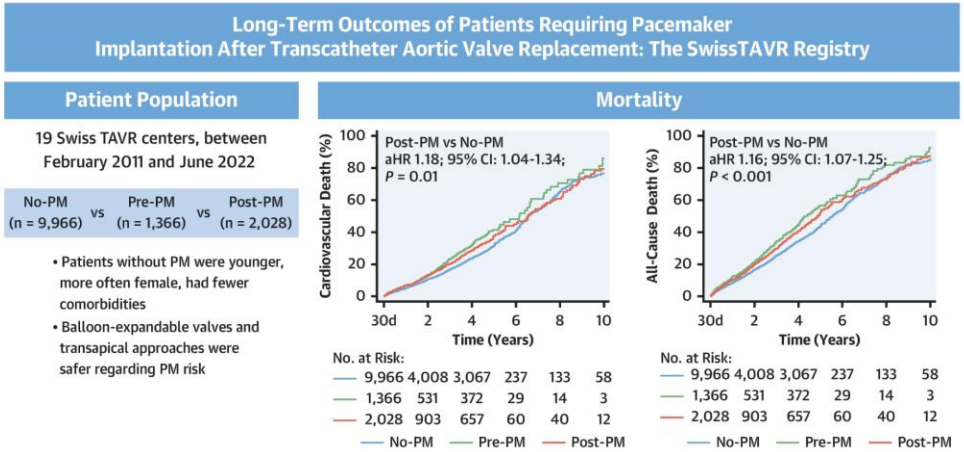


Figure 2. Data from SwissTAVR Registry showing increased long-term mortality and cardiovascular death in post-TAVR PPM patients compared to post-TAVR non-PPM patients

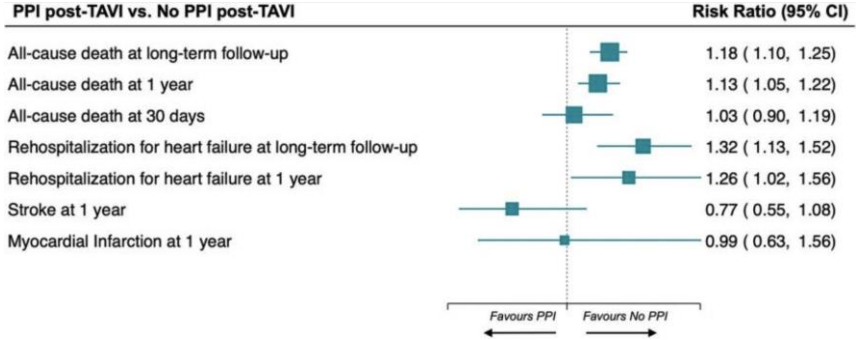


Figure 3. Large multicenter, international metanalysis of over 50,000 TAVR patients from 2022 showing increased all-cause death at 1 year and death at long-term follow up in patients receiving post-TAVR PPM.

Expert Consensus:

There is a 13-18% long-term all-cause mortality increase in patients who receive PPM post-TAVR

Badertcher et al. *JACC.* 2025;18 (9):1163-1171; Zito et al. Europace. 2022; 21;24 (17): 1127-1136

Is PPM Post-TAVR Bad?

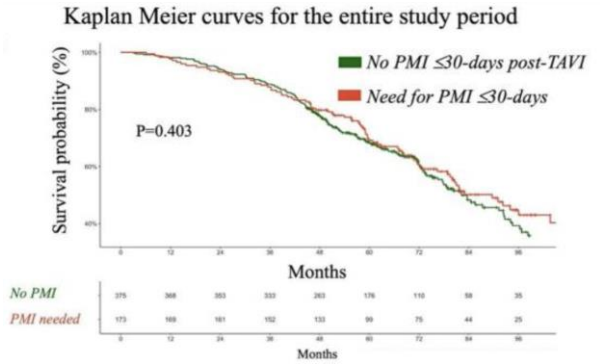


Figure 4. Prospective analysis of 548 TAVRs from Norwegian registries showed no difference in rates of all cause mortality between PPM and non-PPM cohorts over median 5 year follow up

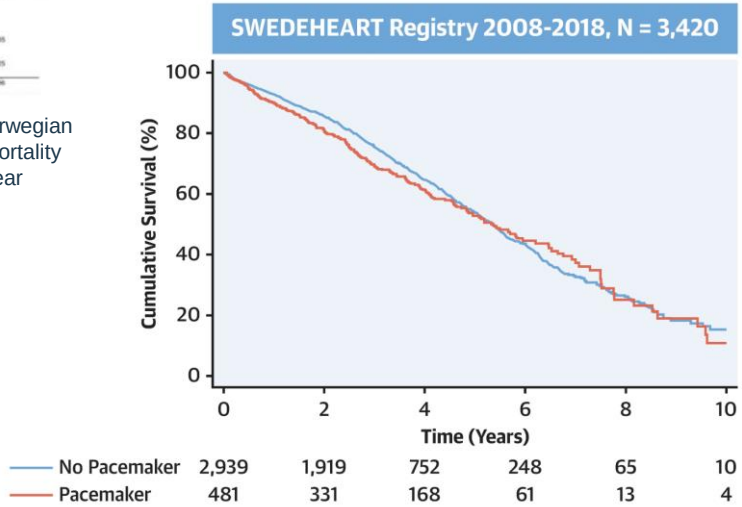


Figure 5. Analysis of 3,400 TAVRs from SWEDEHEART Registry showed no difference in long-term survival between PPM and non-PPM cohorts

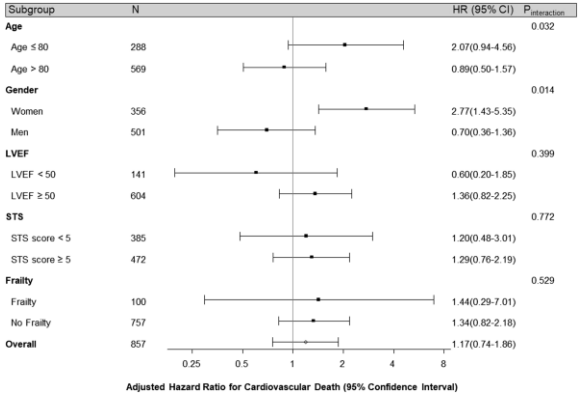


Figure 6. Analysis of 857 TAVRs from PARTNER 2 S3 registries showed no difference in rates of cardiovascular death between PPM and non-PPM cohorts

However:

Multiple retrospective and prospective reports find no difference in long-term MACE/Mortality outcomes attributable to PPM after TAVR

Wasim et al. *BMJ Open*. 2025;15(2); Rück, A. et al. *J Am Coll Cardiol Intv*. 2021;14(19):2173-2181; Chen et al. JACC Card Intv. 2024;17(11):1325-1336

Purpose

Primary

Is there a difference in **MACE** or **Mortality at 1 year** in patients receiving **post-TAVR PPM** compared to non-PPM patients?

Secondary

Is there a difference in **MACE** or **Mortality at 1 year** associated with **PPM placement** when stratifying by TAVR **admission status**?

Is there a difference in the **incidence** of **post-TAVR PPM** placement when stratifying by **elective** vs **non-elective** admission status

Among patients receiving post-TAVR PPM, is **implantation timing** associated with a **difference in MACE or Mortality at 1-year?**

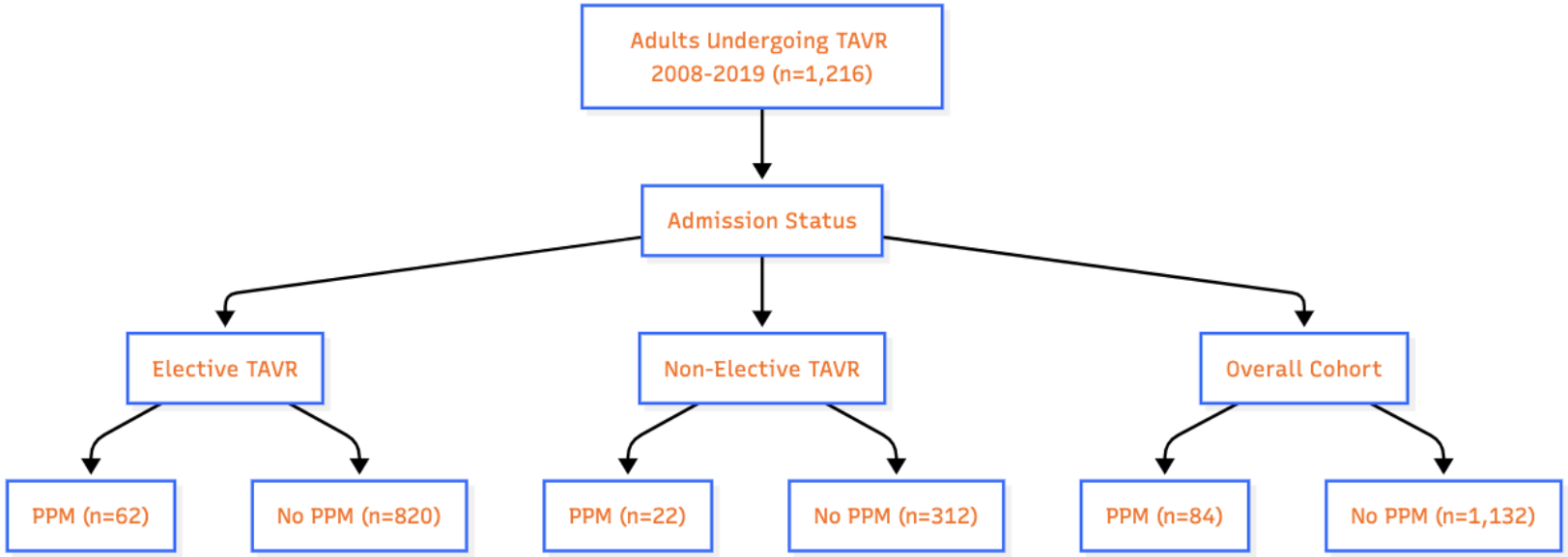
Methods

- **MIMIC IV Database**: de-identified data for over 360,000 patients from Beth Isreal Deaconess Medical Center between 2008-2019
- 1,216 TAVR patients (age >/= 18) were identified with ICD-10, ICD-9, CPT codes.
- Patients who received PPM post-TAVR during hospitalization (n=84) were identified with ICD-10, ICD-9, and CPT codes.

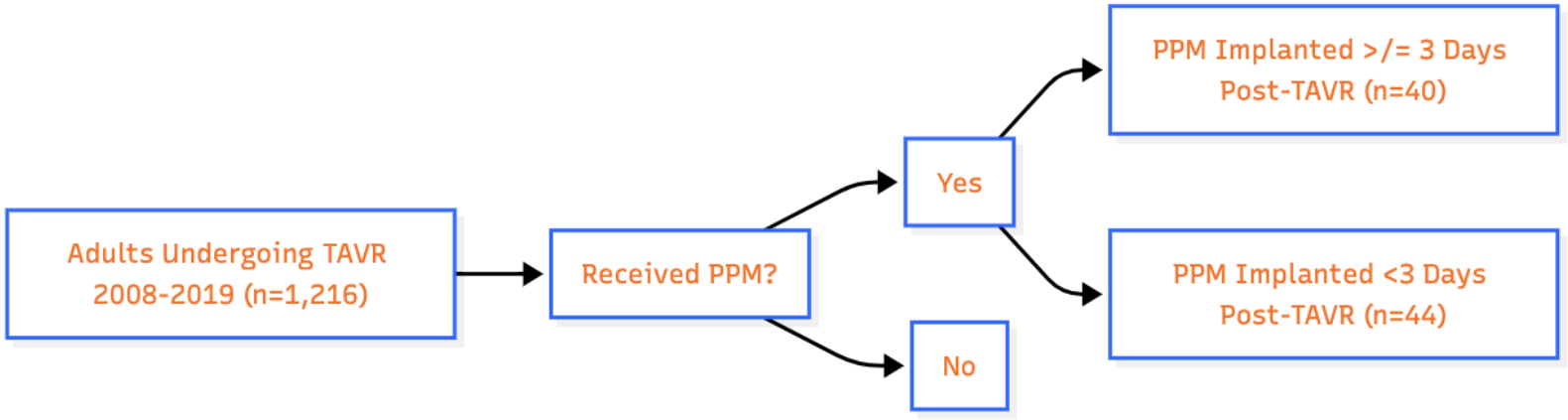
Methods

- TAVR Patients were divided into “elective” and “non-elective” admission status groups
- Patients were sorted into “early pacing” and ”late pacing” cohorts
- Late pacing was defined as PPM implantation 3 or more days post-TAVR

Methods


Adults Undergoing TAVR
2008-2019 (n=1,216)
Admission Status
Elective TAVR
Non-Elective TAVR
Overall Cohort
PPM (n=62)
No PPM (n=820)
PPM (n=22)
No PPM (n=312)
PPM (n=84)
No PPM (n=1,132)

Methods


Adults Undergoing TAVR
2008-2019 (n=1,216)
Received PPM?
Yes
No
PPM Implanted >/= 3 Days
Post-TAVR (n=40)
PPM Implanted <3 Days
Post-TAVR (n=44)

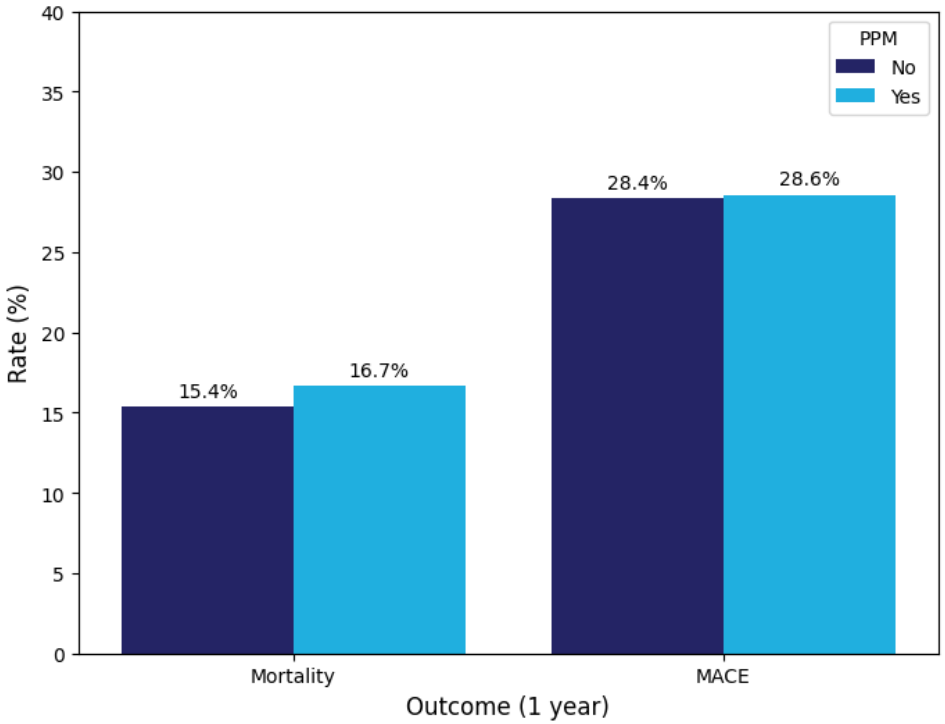
Results

Baseline Characteristics			
Variable	**No PPM (n=1132)**	**PPM (n=84)**	**P-Value**
Age (years)	80.5 ± 9.0	81.4 ± 7.0	0.27
Female (%)	54.8%	54.8%	1.000
Hypertension (%)	31.2%	25.0%	0.288
Diabetes Mellitus (%)	35.6%	47.6%	0.037
CKD (%)	37.1%	41.7%	0.473
COPD (%)	23.6%	23.8%	1.000
Heart Failure (%)	69.5%	64.3%	0.379

*Low standardized mean difference in comorbidities

Primary Outcome – Overall TAVR Cohort

Endpoint	Group	Total Patients	Outcome	Rate	p-Value
1-Year Mortality	*PPM*	84	14	*16.7%*	0.827
	No PPM	1132	174	*15.4%*	
1-Year MACE	*PPM*	84	22	*26.2%*	1.000
	No PPM	1132	302	*26.7%*	



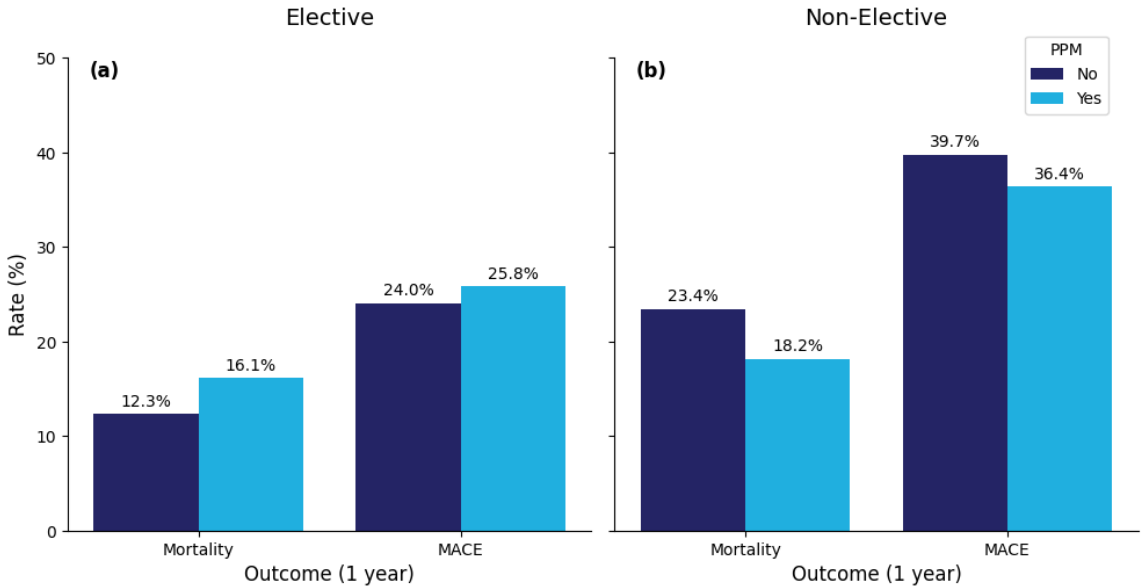
Secondary Outcome – Elective and Non-Elective Cohorts

Elective TAVR

Endpoint	Group	Total Patients	Outcome	Rate	p-Value
1-Year Mortality	*PPM*	62	10	*16.1%*	0.827
	No PPM	820	101	*12.3%*	
1-Year MACE	*PPM*	62	16	*25.8%*	1.000
	No PPM	820	185	*22.6%*	

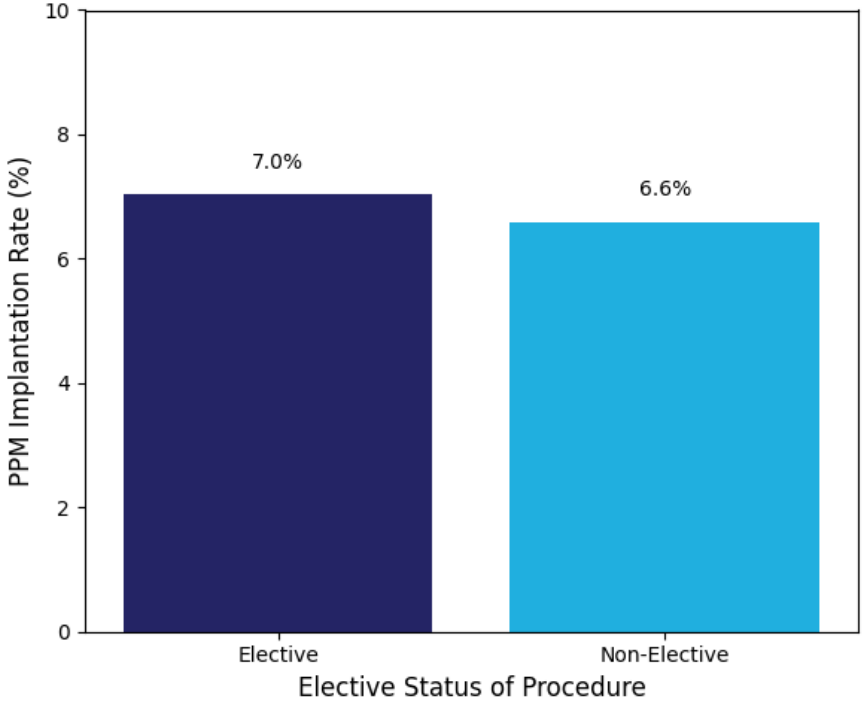
Non-Elective TAVR

Endpoint	Group	Total Patients	Outcome	Rate	p-Value
1-Year Mortality	*PPM*	22	4	*18.2%*	0.765
	No PPM	312	73	*23.4%*	
1-Year MACE	*PPM*	22	6	*27.3%*	0.464
	No PPM	312	117	*37.5%*	



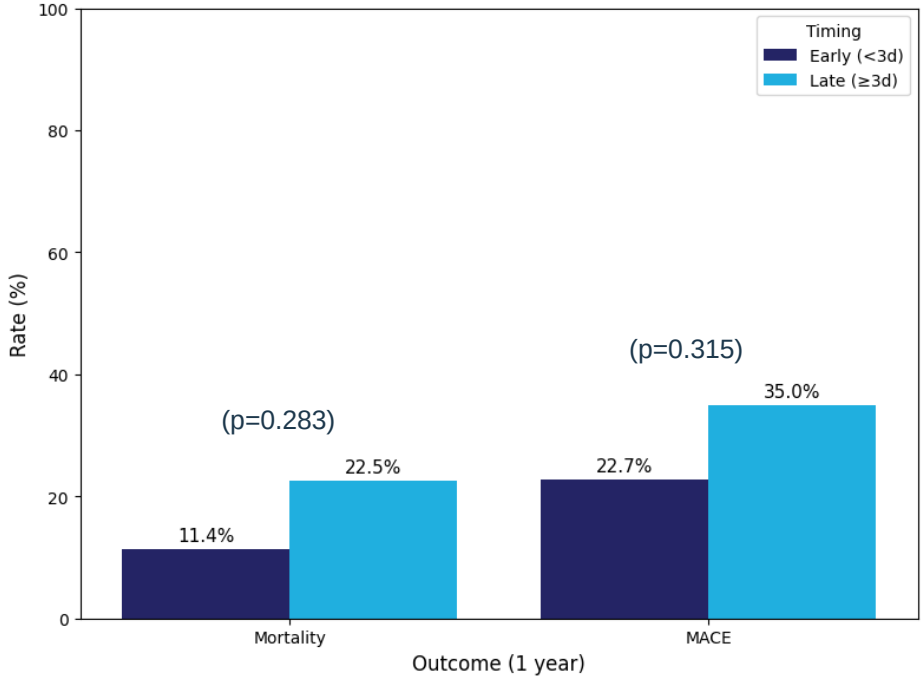
Secondary Outcome – Incidence of PPM by Admission Status

TAVR Admission Status	No PPM	PPM	Total	% with PPM	p-Value
Elective	*820*	62	882	*7.0%*	0.885
Non-Elective	*312*	22	334	*6.6%*	
Total	*1,132*	84	1,216	*6.9%*	



Secondary Outcome – Effects of Implantation Timing

Outcome	Early Pacing	Late Pacing	P-Value
1-Year Mortality	5/44 (11.4%)	9/40 (22.5%)	0.283
1-Year MACE	10/44 (22.7%)	14/40 (35.0%)	0.316



In Summary

Primary

PPM post-TAVR was **not associated** with a **significant difference** in **MACE** or **Mortality** at 1 year.

Secondary

This **trend persisted** when specifically analyzing **elective** and **non-elective** cohorts

There was **no difference** in the **incidence** of **post-TAVR PPM** placement when **stratifying by admission status**

Patients who received a PPM **3 or more days post-TAVR** had ***numerically increased*** rates of **MACE** and **Mortality** at 1 year

Conclusions

- More data are needed to analyze the effects of implantation timing on cardiovascular outcomes at 1 year
- Further research into the factors that impact MACE and Mortality in patients receiving post-TAVR PPM is needed

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References: