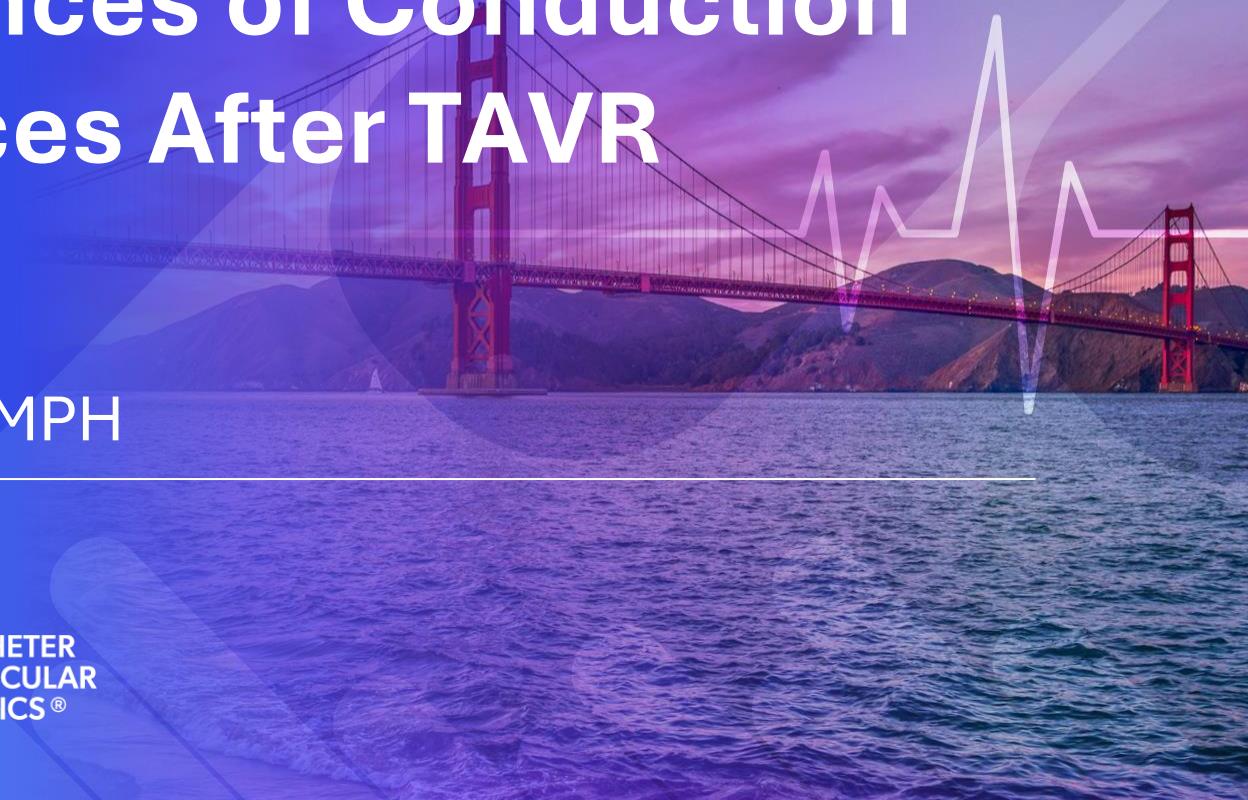


Incidence and Clinical Consequences of Conduction Disturbances After TAVR

Amit N. Vora, MD MPH



Disclosure of Relevant Financial Relationships

Within the prior 24 months, I have had a financial relationship with a company producing, marketing, selling, re-selling, or distributing healthcare products used by or on patients:

Nature of Financial Relationship

- Grant/Research Support
- Consultant Fees/Honoraria
- Individual Stock(s)/Stock Options
- Royalties/Patent Beneficiary
- Executive Role/Ownership Interest
- Other Financial Benefit

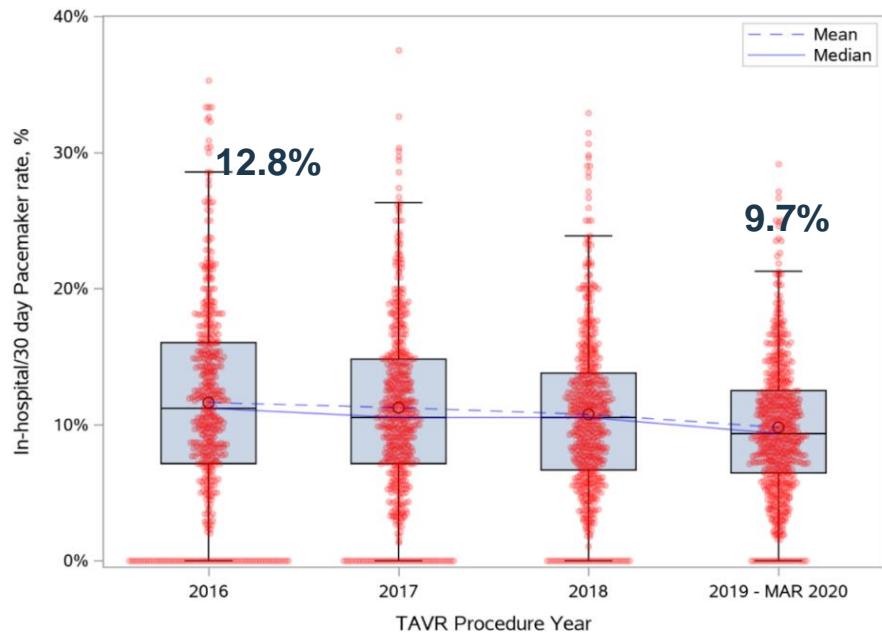
Ineligible Company

- None
- Medtronic, Edwards Lifesciences
- ConKay Medical
- None
- None
- None

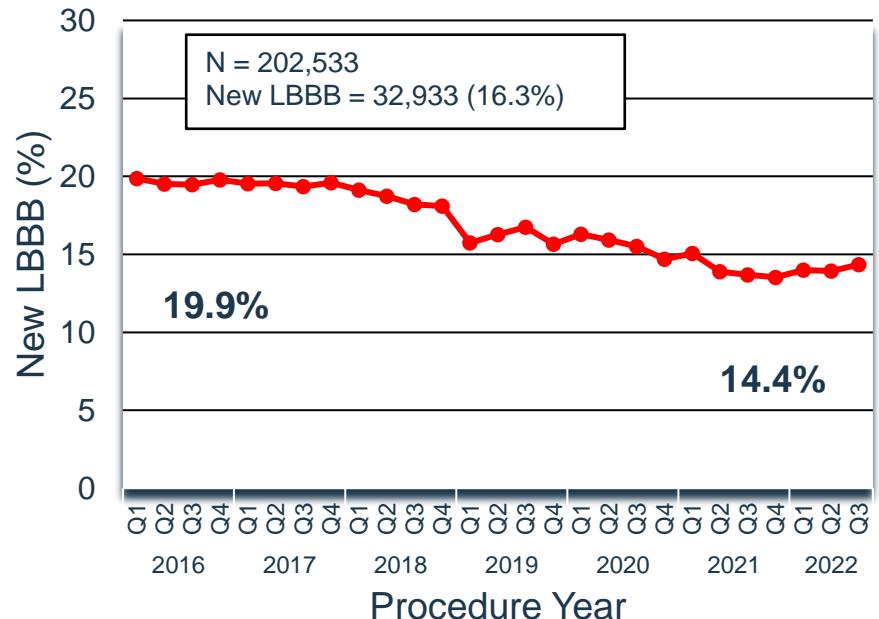
All financial relationships have been mitigated.
Faculty disclosure information can be found on the app

Incidence of Conduction System Abnormalities

Pacemaker implantation

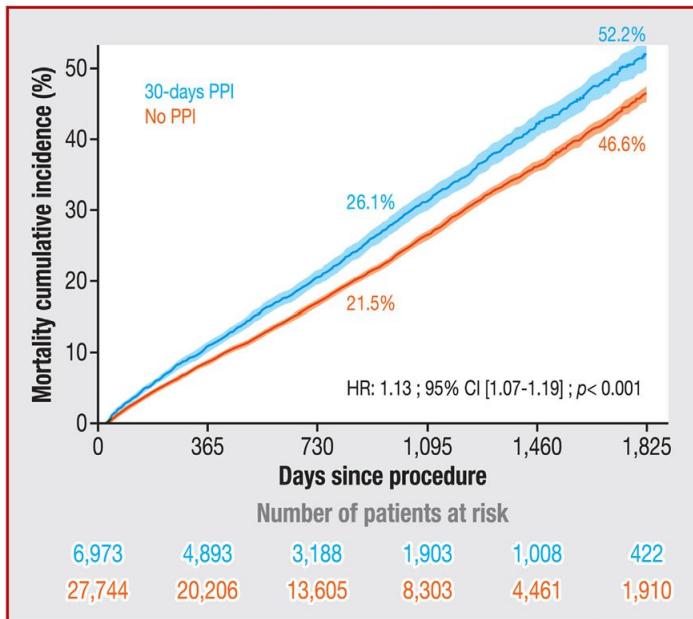


LBBB

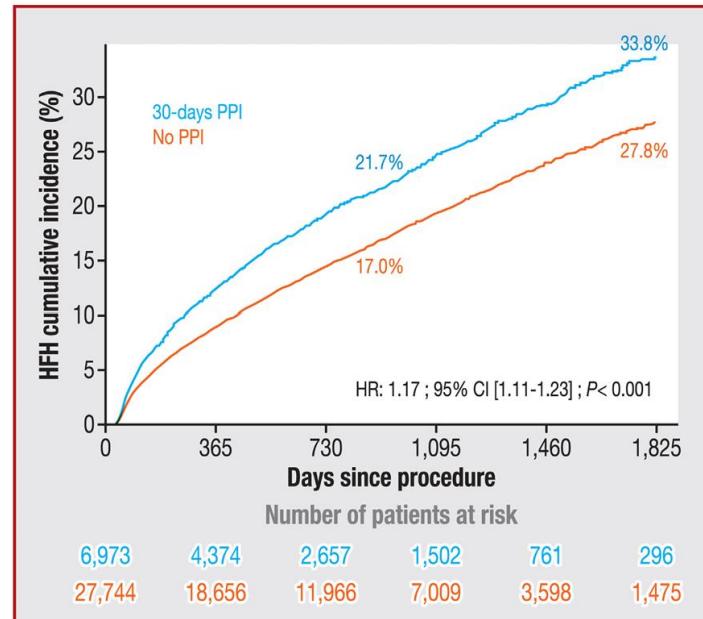


Adverse outcomes after permanent pacemaker – FRANCE-TAVI Registry

All-cause mortality



Heart Failure Hospitalization



Predictors of Conduction System Abnormalities

Clinical / Demographic

Sex
Age
Diabetes mellitus
Prior CAD/CABG

Anatomic

MS Length
Annular / LVOT area
Degree oversizing
Calcium burden
MAC

Permanent Pacemaker

Left Bundle Branch Block

Electrocardiographic

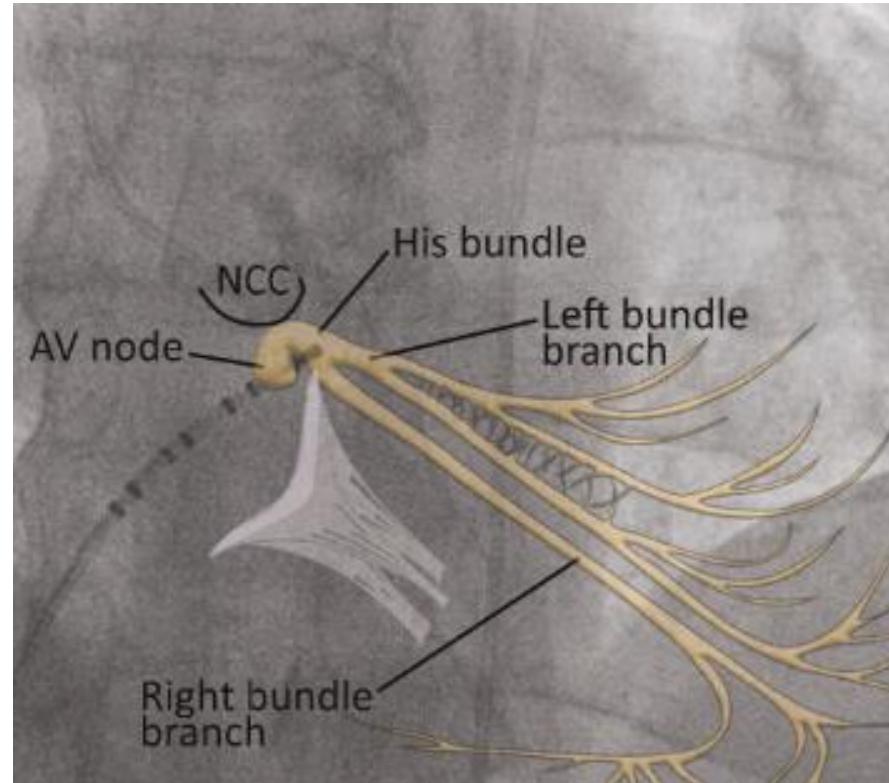
RBBB
LAFB/LBBB
1° AVB
Wide QRS

Procedural

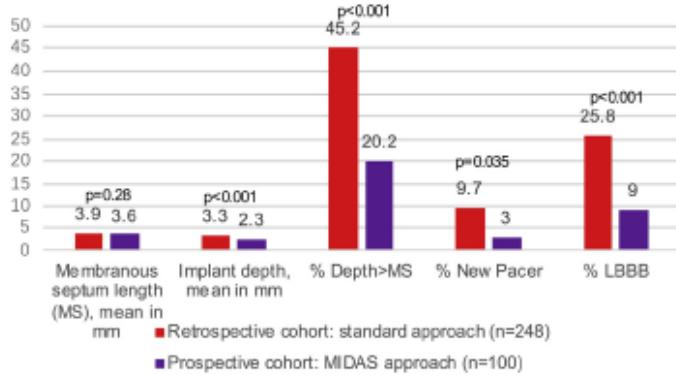
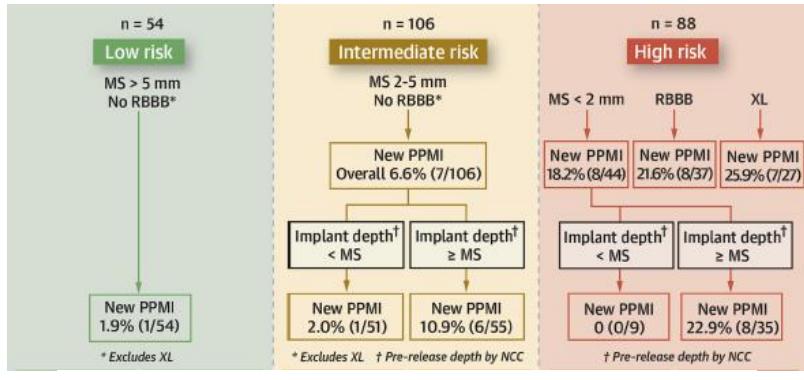
Valve selection
Depth of implant
Pre-dilation
Post-dilation
Intraprocedural AVB

Mechanism of conduction system disturbance

- Conduction fibers originate below level of membranous septum
 - Interaction w/ guidewire/valve/balloon/delivery system can lead to disturbance
- Postmortem studies have demonstrated injury to be due to:
 - Direct compression
 - Hemorrhage
 - Ischemia
 - Inflammation
- Conduction system abnormalities exist along a continuum
 - Strategies to minimize PPM also reduce likelihood of LBBB



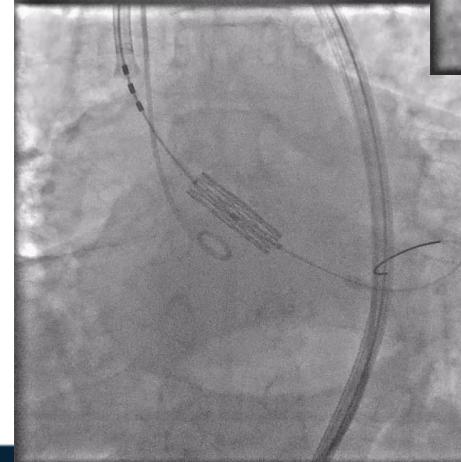
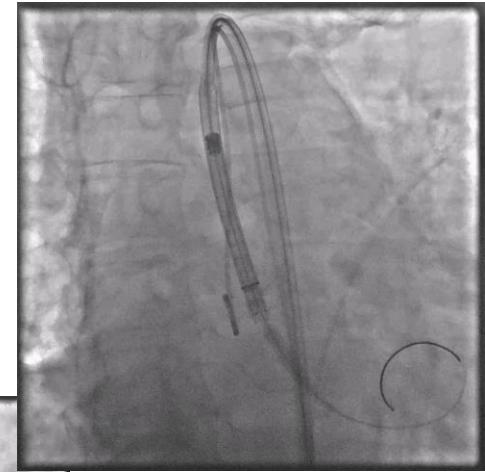
Depth of implantation matters!



Jilaihawi, H. et al. JACC Intv. 2019

Cusp overlap technique:

- Isolate NCC and overlap LCC/RCC
- Aortogram in cusp overlap view and LAO view to ensure depth

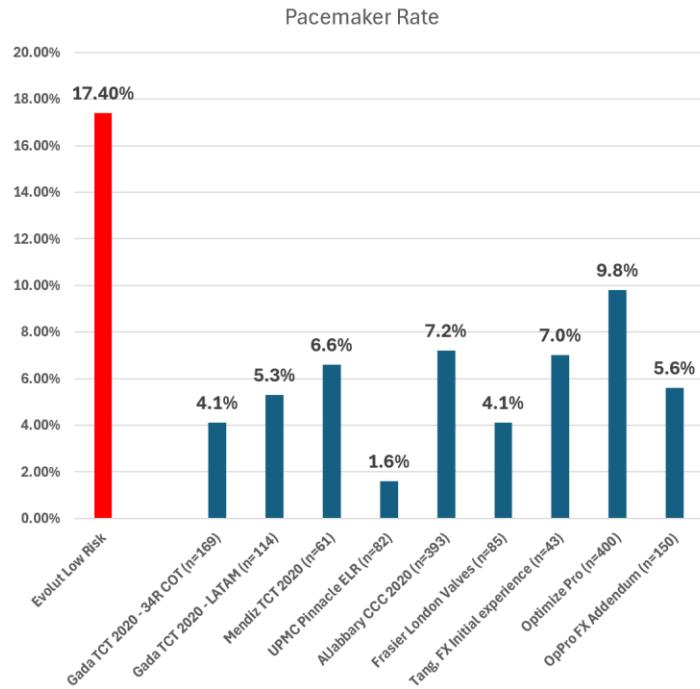


High deployment technique

- Line up at “lucent line”
- RAO/CAU angulation to remove parallax from valve
- Deploy

Pacemaker Rates with Contemporary Techniques

Evolut – Cusp Overlap Technique



S3 – High Deployment Technique

Conventional Deployment Technique	High Deployment Technique	
Implantation Depth	3.2 ± 1.9 mm	
30-day Permanent Pacemaker Implantation	13.1%	
New-onset Left Bundle Branch Block at Discharge	12.2%	
1-year Aortic Regurgitation	15.9% 2.7% Mild ($\geq 1+ - < 2+$) Moderate-to-severe ($\geq 2+$)	16.5% 1%
1-year Hemodynamic Performance	11.8 ± 4.9 mmHg 22.5 ± 9 mmHg 0.48 ± 0.13	Mean gradient Peak gradient Doppler velocity index 13.1 ± 6.5 mmHg 25 ± 11.9 mmHg 0.47 ± 0.15

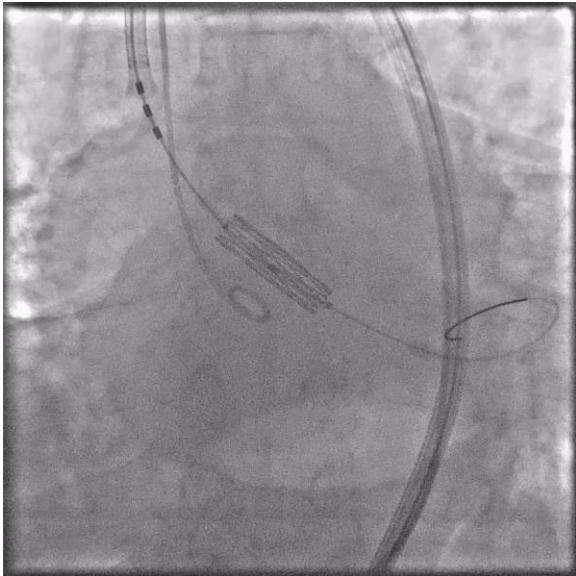
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OPTIMIZE PRO FX Addendum

- N=151 patients at 11 US sites from 9/2022-10/2023
- 3 key COT steps:
 - Initial deployment in cusp overlap projection
 - Begin deployment at mid-pigtail or higher
 - Assess depth in cusp overlap view at 80%
- Primary outcome: death/stroke at 30d: **2.7%**
- Rate of PPM at 30d: **6.7%**
- New LBBB: **26.4%**
- Factors influencing PPM rate:
 - Lunderquist: 5.9% vs 8.3%, p=0.56
 - Depth <6mm: 3.4% vs. 12.8%, p=0.04
 - Depth >MSL: 0.0% vs 10.5%, p=0.03
- 1 patient required second valve

The best way to avoid PPM is a precise, shallow implant

The Price of Shallow Implantation



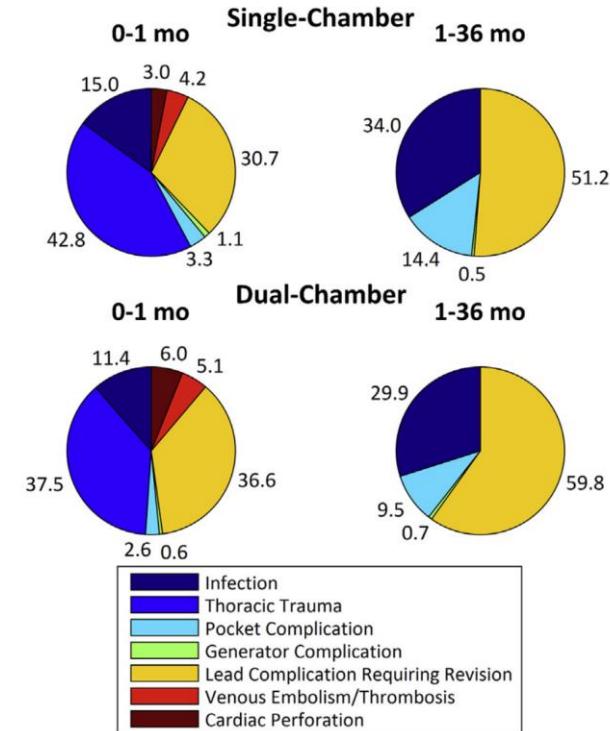
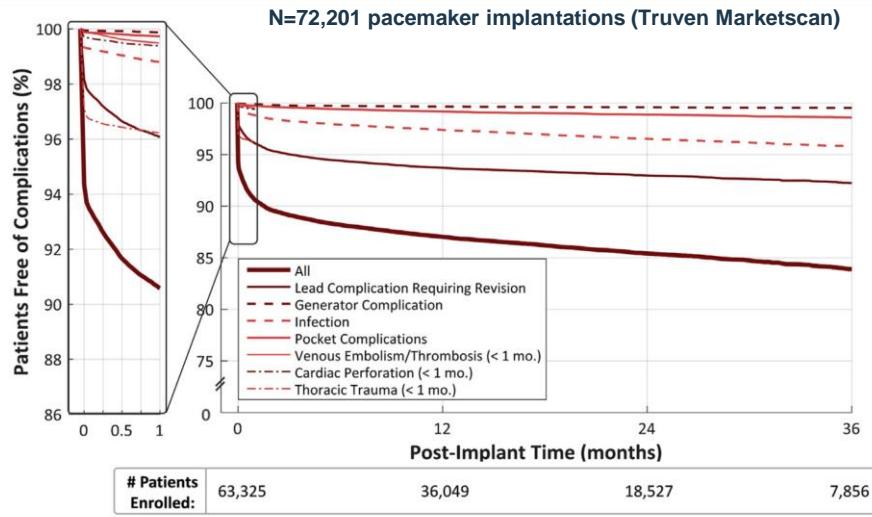
Short Term

- Less safety margin for valve movement during deployment
- Migration/Embolization

Long Term

- Coronary Re-access
- Future ViV options

Transvenous pacemakers are not benign!

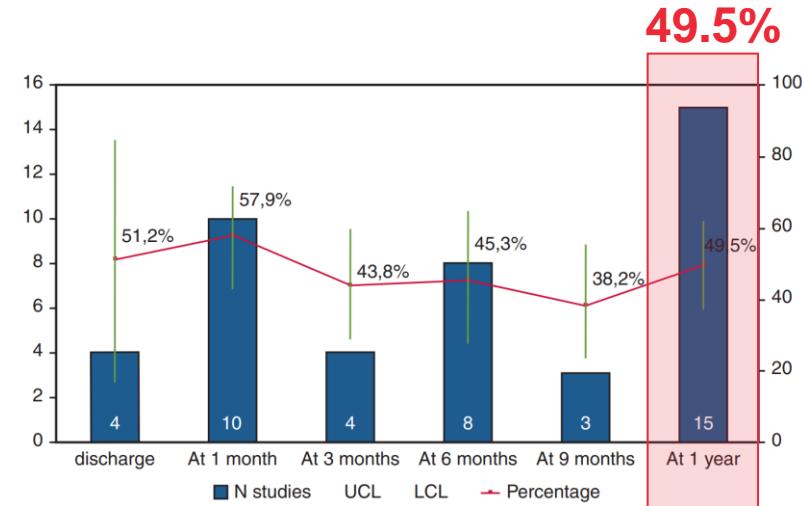
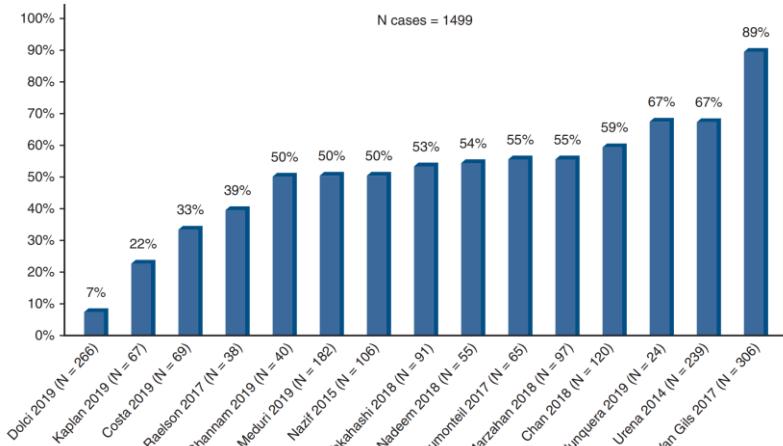


Risk of device complications:

- 9.1% at one month
- 15% by 3 years

Thoracic trauma = pneumo/hemothorax

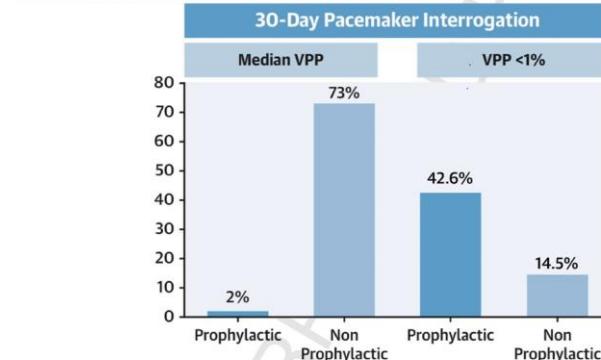
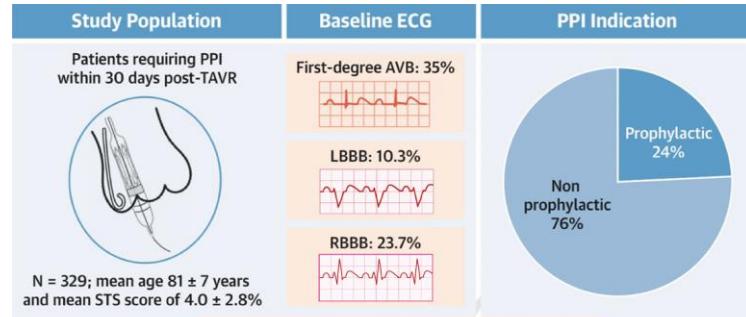
Pacemaker Dependency at 1 year



In this meta-analysis (23 studies, n=18,610 patients), up to 50% of patients not pacemaker dependent by 1 year.

PROMOTE Study – Prophylactic PPM

- “Prophylactic” PPM if:
 - Enlarged QRS w/ daily changes ($\geq 20\text{ms}$ ↑ in PR or QRS for 2+ days)
 - QRS $>150\text{ms}$ OR PR $>240\text{ms}$
- Overall PPM rate 15.6%, 24% were for prophylactic indication
- Prophylactic PPMs had:
 - Median 2% VPP (c/w 73%)
 - 42.6% had VPP $<1\%$ at 30d
 - No difference whether EPS performed prior
 - *But: 5% in this group were PPM dependent!*



- About one fourth of patients receiving PPI after TAVR had a prophylactic indication
- Despite similar clinical outcomes, prophylactic PPI patients exhibited a very low pacing burden at 30 days.
- These findings would not support prophylactic PPI following TAVR

Fischer Q, et al. JACC Clin Electrophysiol. 2025; ■(■):■-■.

Summary

- Conduction system abnormalities are the most common complications following TAVR and are associated with higher morbidity, mortality, and cost
 - Techniques to limit PPM placement also will limit LBBB
- Overall rates are decreasing with time
 - Platform iterations (Evolut FX+, Navitor Vision)
 - Improved implantation technique (COT, HDT)
- Identifying patients requiring PPM over time remains challenging:
 - Shallower implant can reduce PPM but with downstream short/long-term consequences
 - PPM are not benign
 - There is still a need for effective algorithms to identify high-risk patients post-TAVR