

TAVR – QUICK, EASY and EFFICIENT

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Disclosures

- Research Valve Trial Participation
 - Edwards Lifesciences
 - Abbott
 - Medtronic
- Course Faculty
 - Edwards Lifesciences

Transcatheter versus Surgical Aortic-Valve Replacement in High-Risk Patients



- 100% general anesthesia with TEE guidance
- ~ 30% transapical (transfemoral by surgical cutdown)
- ~ 6% neurologic events
- ~ 17% vascular complications
- ~ 9% major bleeding
- ~ 3% renal replacement therapy
- ~ 4% new pacemaker
- Median ICU stay 3 days
- Median LOS 8 days



C Smith et al. 2011;364:2187-98

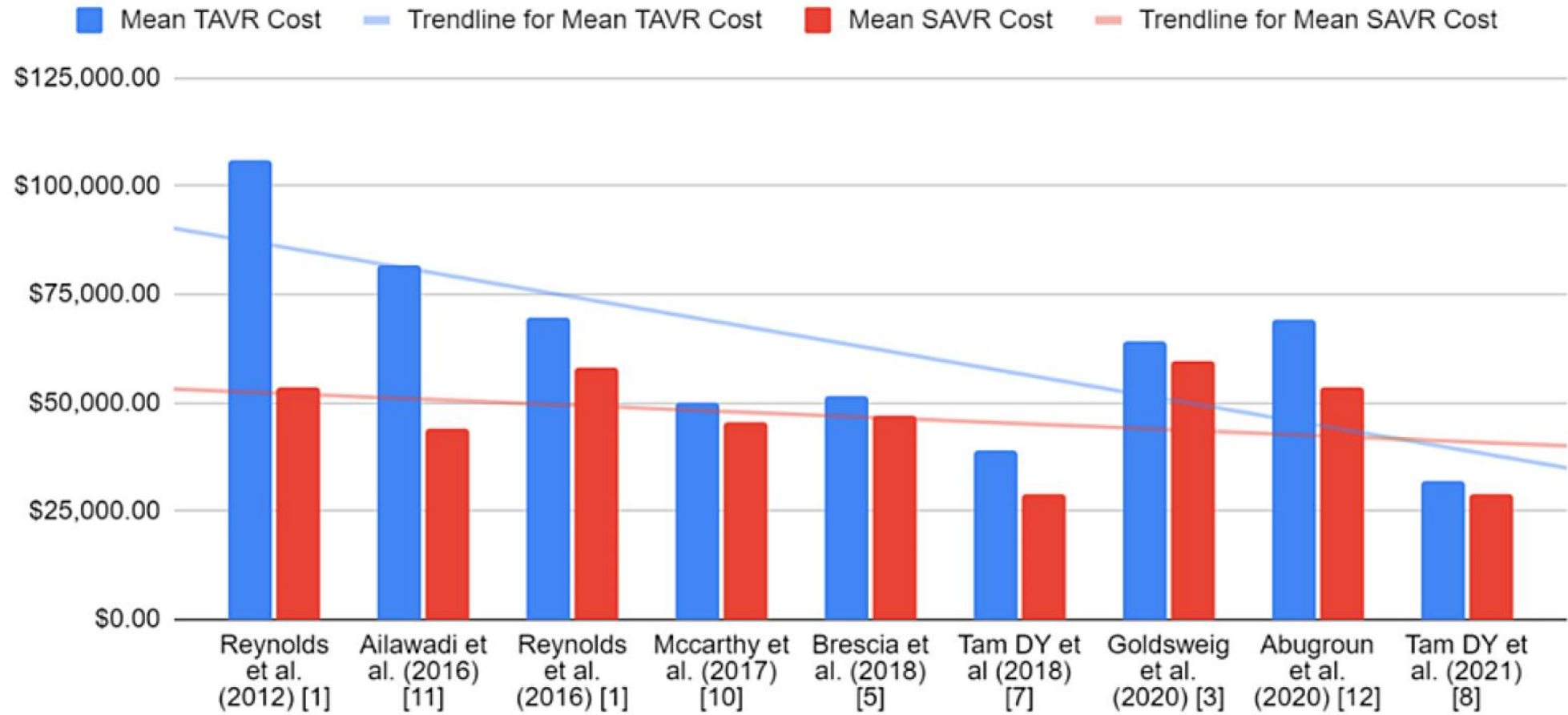
How TAVR Became More Efficient

- Increased experience
- CT Imaging
- Percutaneous access and closure
- Smaller sheath sizes
- Conscious sedation
- Better case and discharge planning
- Other novel practices

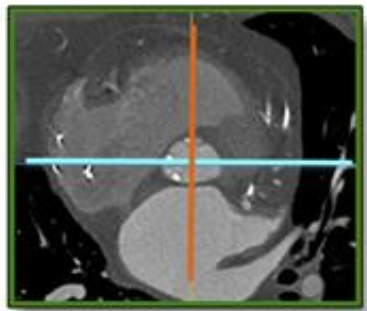


And More Cost Effective

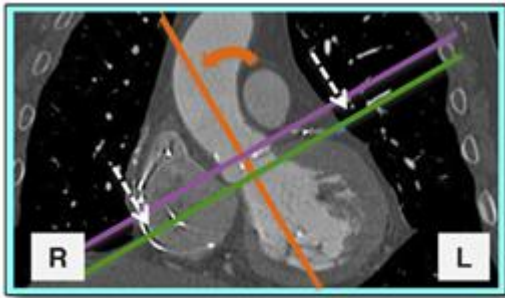
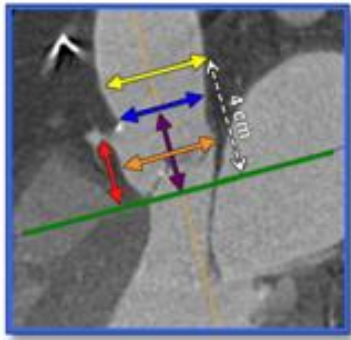
Mean TAVR Cost and Mean SAVR Cost



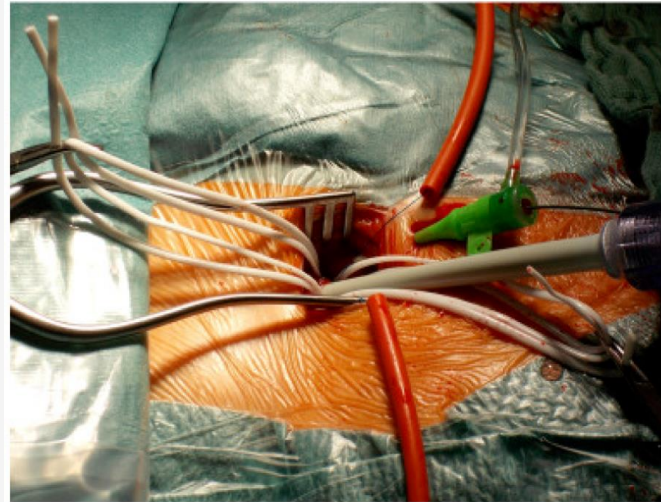
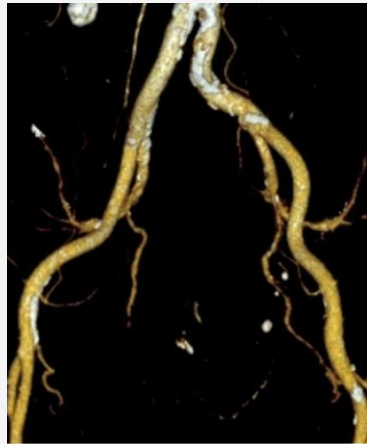
The First Breakthroughs – CT Planning and Percutaneous Access & Closure



Transverse Plane



Coronal Oblique Plane



2013

2016

2017

2019



Decreased procedure time and LOS

Valve sizing, coronary heights,
deployment angle, access etc.

Kasel et al *JACC Imaging* 2013;6:249-52

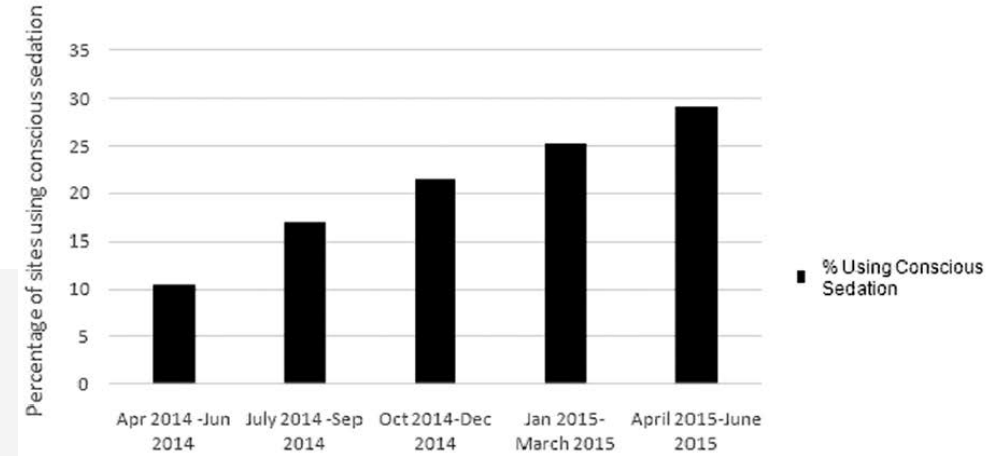
Eckner et al. *J Clin Med* 2021;10:1344,1-9

The Next Big Breakthrough – Conscious Sedation

Conscious Sedation Versus General Anesthesia for Transcatheter Aortic Valve Replacement

Insights from the National Cardiovascular Data Registry
Society of Thoracic Surgeons/American College of Cardiology
Transcatheter Valve Therapy Registry

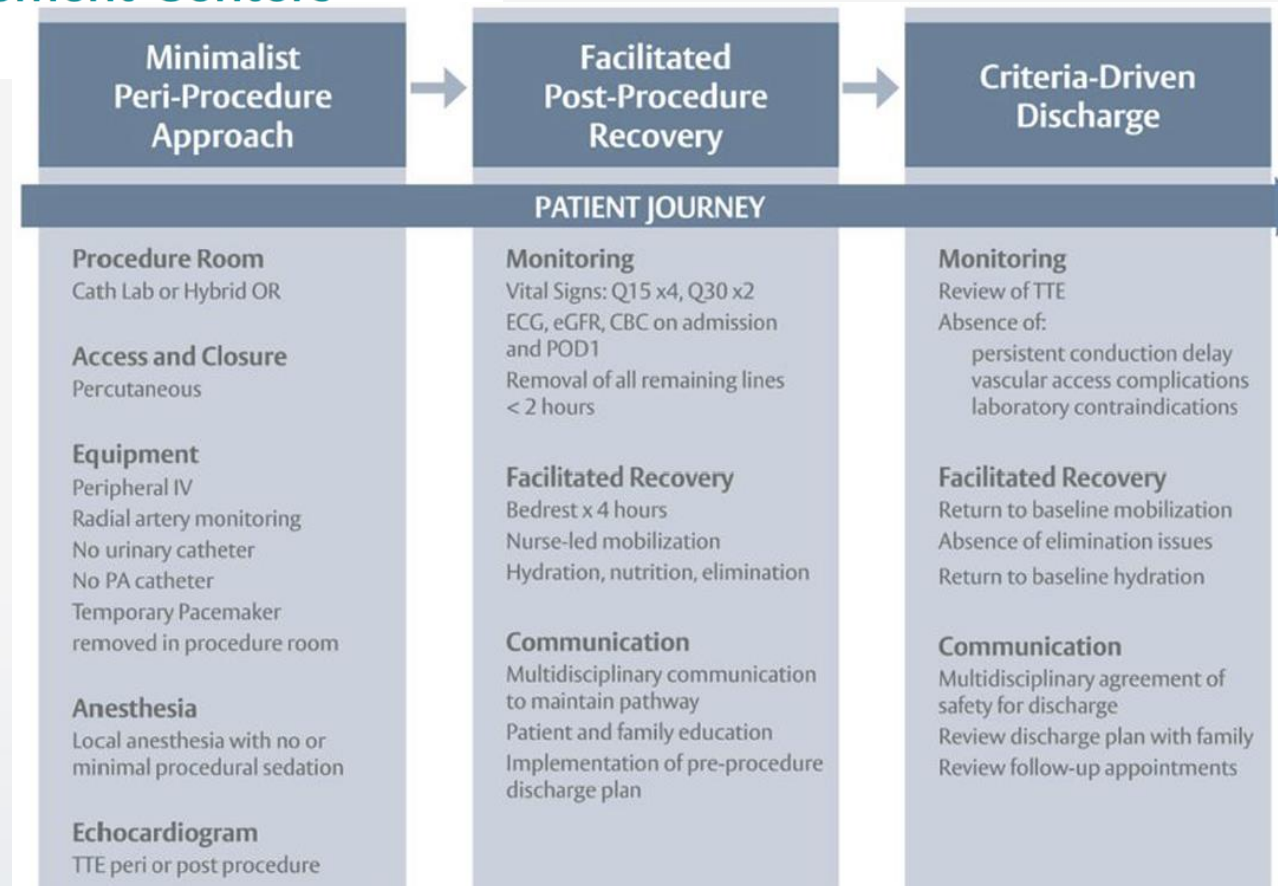
Conscious sedation was associated with reductions in procedural inotrope requirement, intensive care unit and hospital length of stay (6.0 versus 6.5 days, $P < 0.001$), and combined 30-day death/stroke rates (4.8% versus 6.4%, $P < 0.001$).



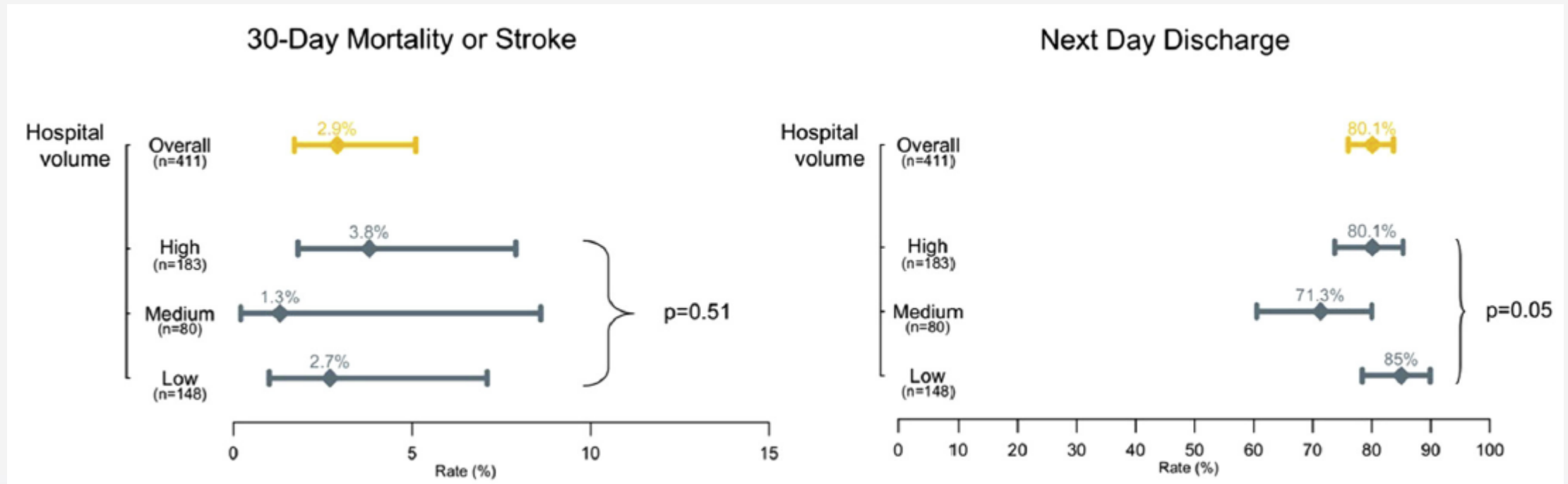
JACC: Cardiovascular Interventions

The Vancouver 3M (Multidisciplinary, Multimodality, But Minimalist) Clinical Pathway Facilitates Safe Next-Day Discharge Home at Low-, Medium-, and High-Volume Transfemoral Transcatheter Aortic Valve Replacement Centers

The 3M TAVR Study



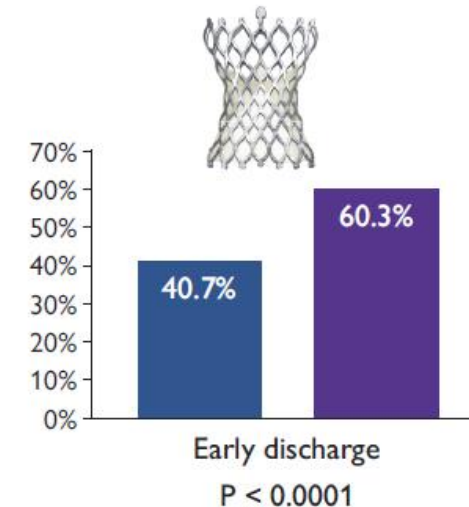
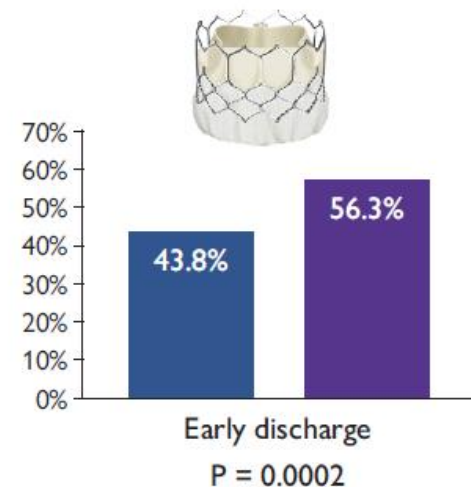
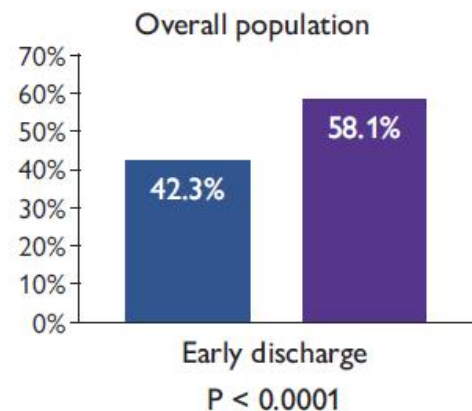
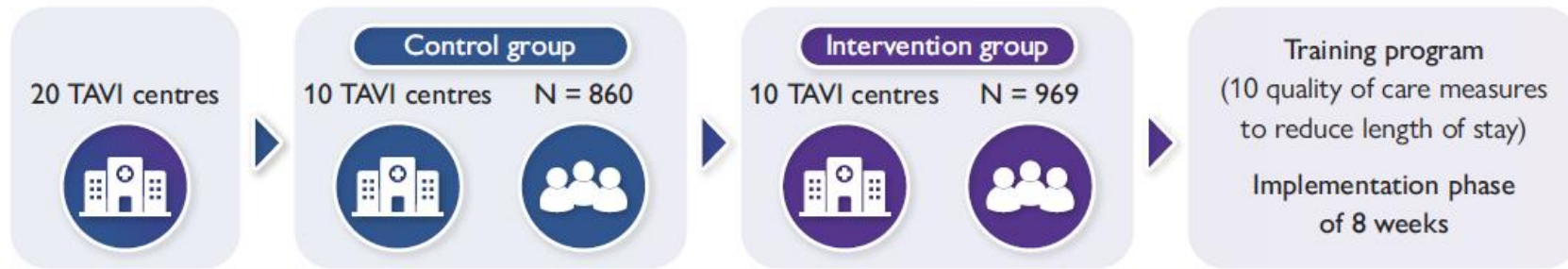
Vancouver 3M TAVR Clinical Pathway



Reducing length of stay after transfemoral transcatheter aortic valve implantation: the FAST-TAVI II trial

European Heart Journal

FAST-TAVI II trial (cluster randomized control study)



● Control group ● Intervention group

FAST-TAVI II quality of care measures

Implementation description

- | FAST-TAVI II quality of care measures | Implementation description |
|---|--|
| 1. Patient and family education | The patient and if possible a family member are informed of early discharge home after the procedure in the absence of complications. |
| 2. Education of medical and paramedical teams | At least one meeting before the start of the study to inform staff involved in procedural and post-procedural care of patients with severe aortic stenosis. |
| 3. Daily monitoring of the patient by the operator and interaction with the rest of the team | Visit of the patient 4 to 6 h after the procedure and daily visit until discharge. |
| 4. Anticipation of post-TAVI TTE on Day 0 or 1 before admission | TTE is scheduled on the same day or the day after the procedure. |
| 5. Use of a decision tree for the management of conductive disturbances to reduce their impact on LOS | A decision tree is required according to local practices or by default the one proposed by Rodes-Cabau J <i>et al.</i> (J Am Coll Cardiol 2019;74:1086–106). |
| 6. Echo-guided or angio-guided puncture of the common femoral artery (principal access) | Echo-guided or angio-guided femoral puncture is required to reduce vascular complications. |
| 7. Echographic or angiographic control of principal femoral access at the end of the procedure | Echographic or angiographic control is required at the end of the procedure to confirm the correct closure of the access site and immediate management of vascular complications even minor. |
| 8. Early mobilization of the patient after the procedure | Early mobilization by a nurse 4–6 h after the procedure in the absence of haemorrhagic or vascular complications. |
| 9. Prevention of bleeding complications | Stop oral anticoagulant therapy at least 48 h before the procedure; prescription of single antiplatelet therapy in patients without indication of oral anticoagulant alone or VKA/DOAC alone in patients without recent percutaneous coronary intervention; contraindication of a loading dose of clopidogrel before TAVI. |
| 10. Prevention of acute kidney injury | Stop nephrotoxic drugs 48 h before the procedure, hydrate the patient before and after the procedure and limit the amount of contrast, especially in patients with chronic renal failure. |

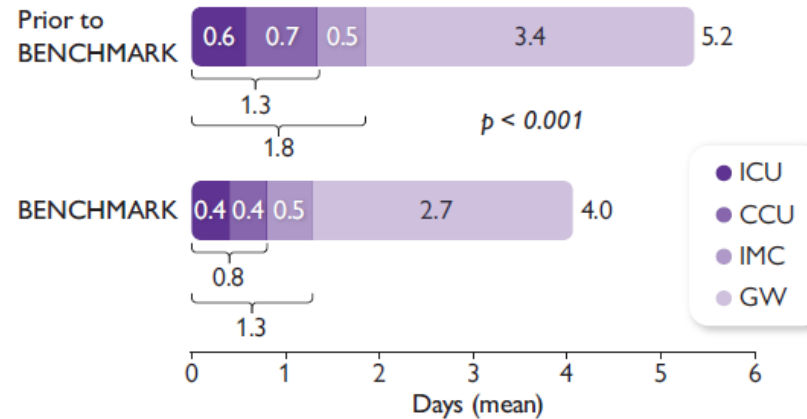
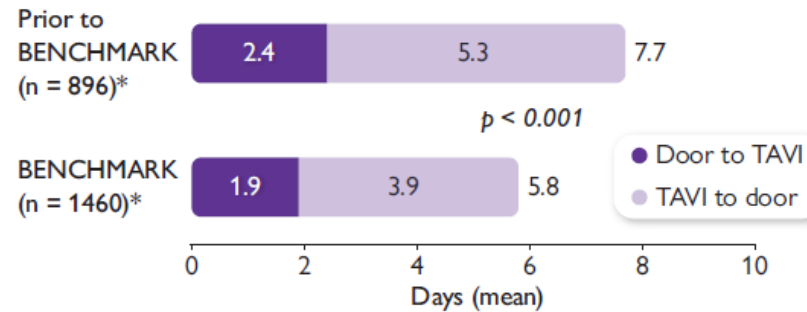
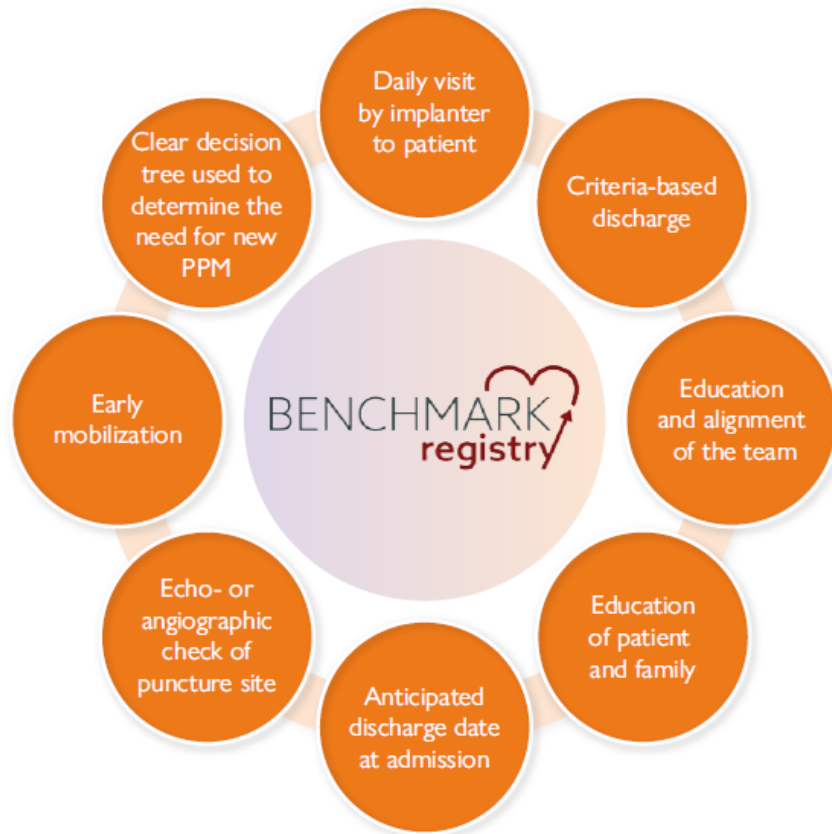
A streamlined pathway for transcatheter aortic valve implantation: the BENCHMARK study

European Heart Journal

BENCHMARK: streamlined TAVI pathway with retained safety

Investigator-initiated, observational, multicentre registry

8 pre-defined BENCHMARK best practices



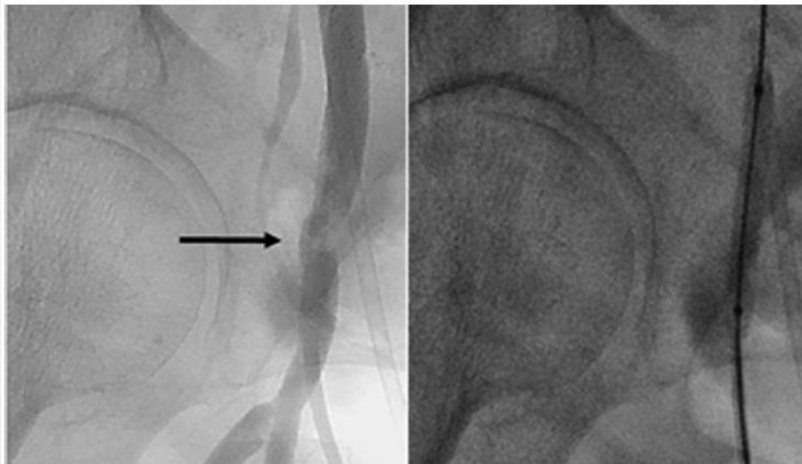
Keys to a Short Hospital Stay

- Make a clear plan with patient and family before procedure
- Develop and follow Best Practices to reduce complications
 - Optimal Vascular Access and Closure
 - Minimal Sedation/Anesthesia
 - Avoid Program Variation
- Have a clear pathway on how to deal with Conduction Issues
- Early Ambulation
- Implanting Physician visits patient daily
- Get pre-discharge Echo as soon as feasible

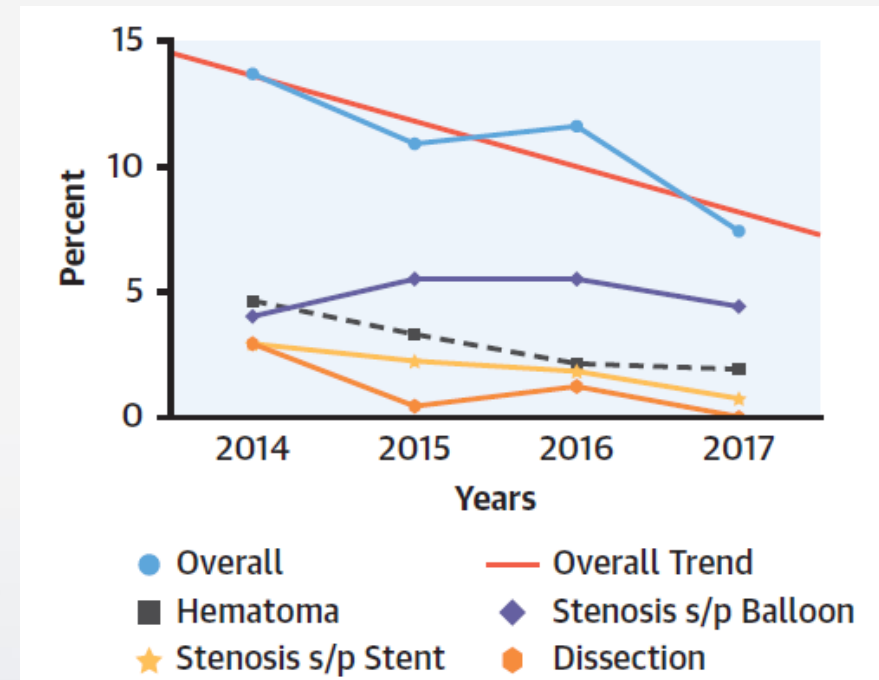
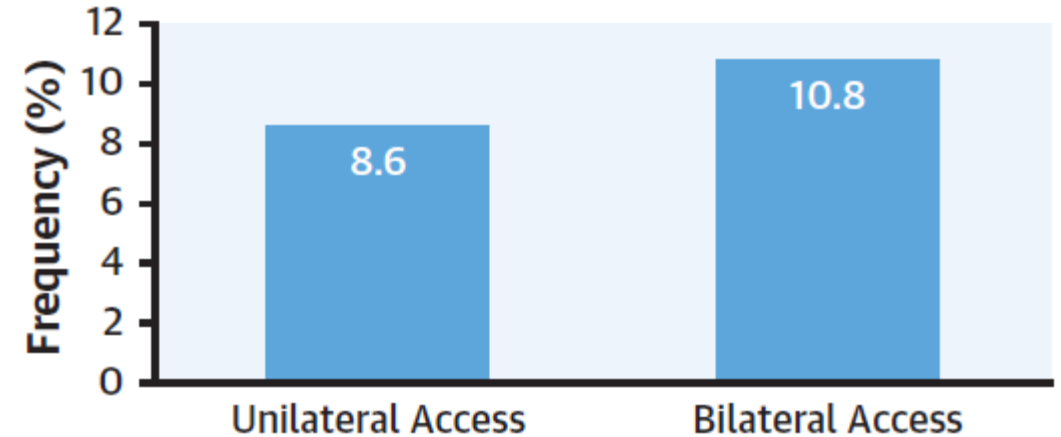
JACC: Cardiovascular Interventions

Unilateral Access Is Safe and Facilitates Peripheral Bailout During Transfemoral-Approach Transcatheter Aortic Valve Replacement

- 1208 TF TAVR patients
- 201 (16.4%) unilateral approach
- No difference in vascular complications
- Facilitates “all sheaths out” approach



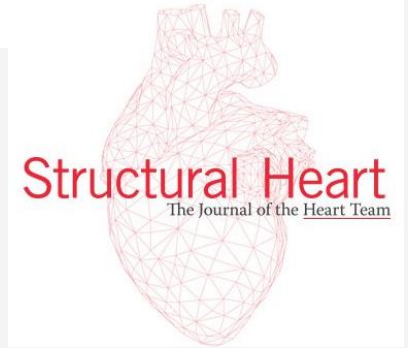
Access-Site Vascular Complications



Khubber et al. 2019;12:2210-20

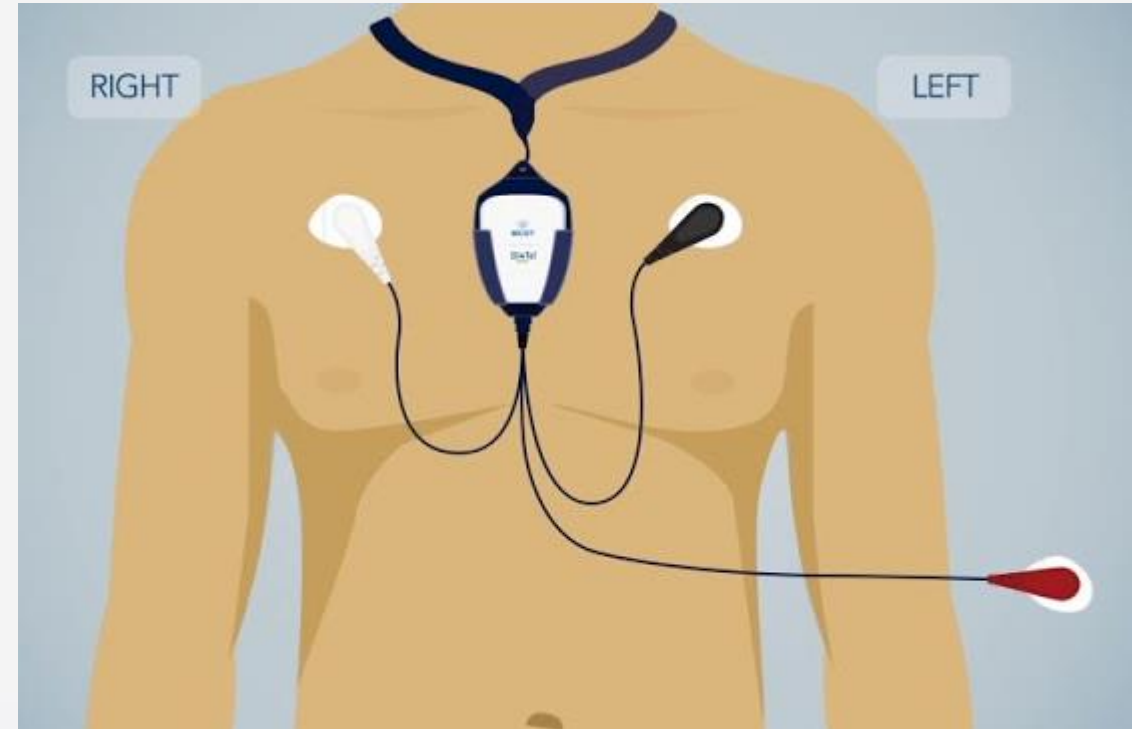
Routine Left Ventricular Pacing for Patients Undergoing Transcatheter Aortic Valve Replacement

- 226 TF TAVR patients
- 99% underwent LV guidewire pacing
- 0.9% LV perforation
- 7.6% required RV pacing post-TAVR



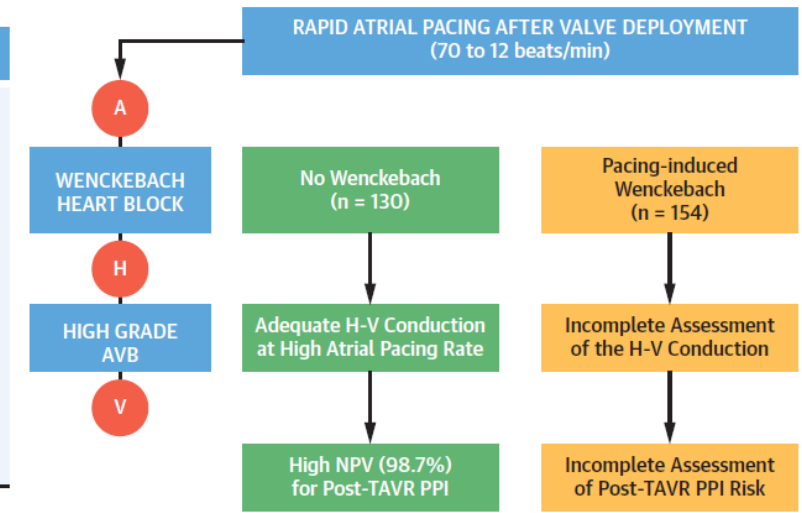
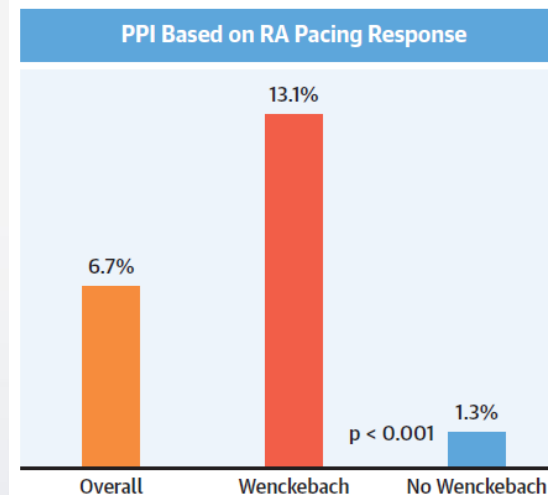
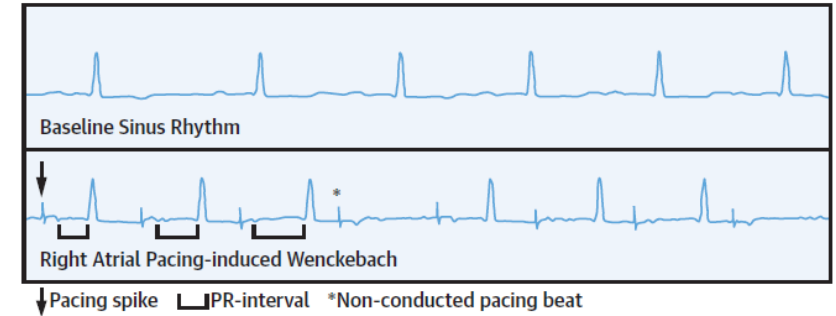
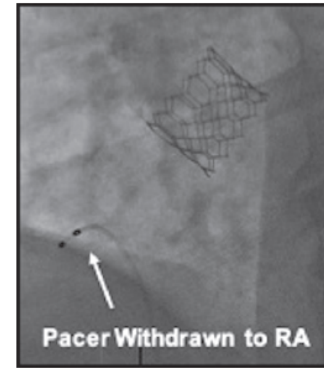
Mobile Cardiac Outpatient Telemetry (MCOT)

- ~15% (60% brady/heart block, 40% A-fib) abnormal monitor before TAVR
- 9% of those monitored post-TAVR have shown high grade / complete heart block
- Consider MCOT before or after TAVR to assess for significant AV conduction issues



The Utility of Rapid Atrial Pacing Immediately Post-TAVR to Predict the Need for Pacemaker Implantation

- Post-deployment stepwise RA pacing (70-120 bpm) to assess for Wenckebach

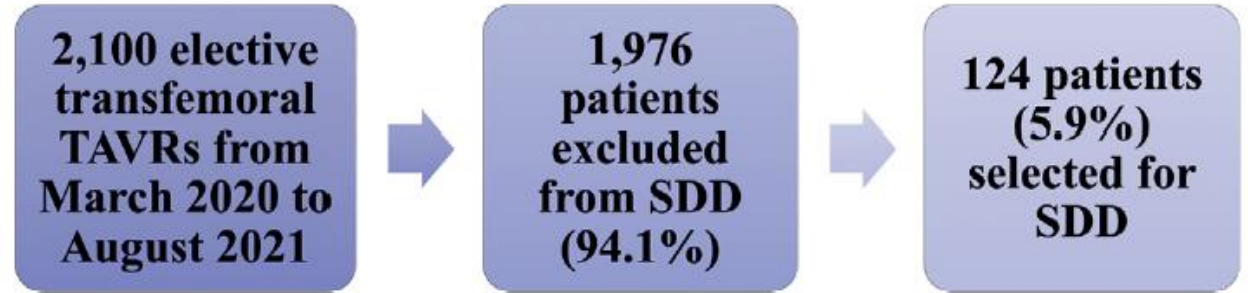


Same-Day Discharge Post-Transcatheter Aortic Valve Replacement During the COVID-19 Pandemic

The Multicenter PROTECT TAVR Study

- 2100 TF TAVR patients at 7 centers
- 124 (5.9%) TAVR by noon → SDD
- 78 y/o, STS 2.4%, 32.3% had PPMs
- 1 (0.8%) with CHB got PPM (and went home)

- 30d CV death/stroke/MI/rehospitalization/vascular injury/new PPM
5.7% (6 out of 106)



Northwestern Same Day Discharge Algorithm

Pre-Procedure

- Low risk (STS <3% PROM)
- Planned transfemoral
- Social support (family member to stay)
- First or second case
- 15 minutes to nearest hospital
- Normal EKG (no RBBB) or PPM
- Able to return to clinic next day
- Patient agreeable

IDENTIFICATION

Procedural

- Transfemoral access
- MAC anesthesia
- Adequate hemostasis
- Absence of conduction disturbance (new LBBB, CHB)
- No procedural complications
- +/- Atrial pacing

IMPLEMENTATION

Post-Procedural

- Admit to Stepdown
- Telemetry for 6 hours
- EKG upon arrival to PACU and 4 hours post (no new LBBB, salvos of AV block)
- Monitor hemostasis and remove sheaths
- Neuro checks
- Walk in 2-4 hours
- Echo at hour 4 for gradient

CONFIRMATION

Post-Discharge

- Given on-call number
- Follow up visit on post-procedure day #1
- Continued communication with Valve team
- Standard follow up

FOLLOW-UP

TAVR – Best Practices for an Early Discharge

Pre-procedure:

Consider MCOT if at high risk of heart block post-TAVR

Percutaneous transfemoral access and closure is preferred to surgical cutdown

Coronary CTA in lieu of invasive angiography to rule out significant CAD

Discharge planning should be complete before the procedure date

Patients identified as eligible for same day discharge should be done early in the day

TAVR – Best Practices for an Early Discharge

Intra-procedure:

Conscious sedation or Monitored Anesthesia Care (MAC)

Extra vascular lines (e.g. radial arterial line) should be avoided

Routine pre-TAVR balloon aortic valvuloplasty is not recommended

Consider aortography to assess for paravalvular regurgitation

Pacing – consider LV pacing, using existing PPM, post-TAVR stepwise RA pacing to assess AV node integrity

Immediate removal of all vascular sheaths (unilateral access)

TAVR – Best Practices for an Early Discharge

Post-procedure:

For complete heart block, consider immediate permanent pacemaker

The ICU should only be used post-TAVR for select patients

Ambulation as early as possible

Pre-discharge echocardiography can be done shortly after the procedure

Daily visit by implanting physician

Consider an MCOT for new conduction abnormalities

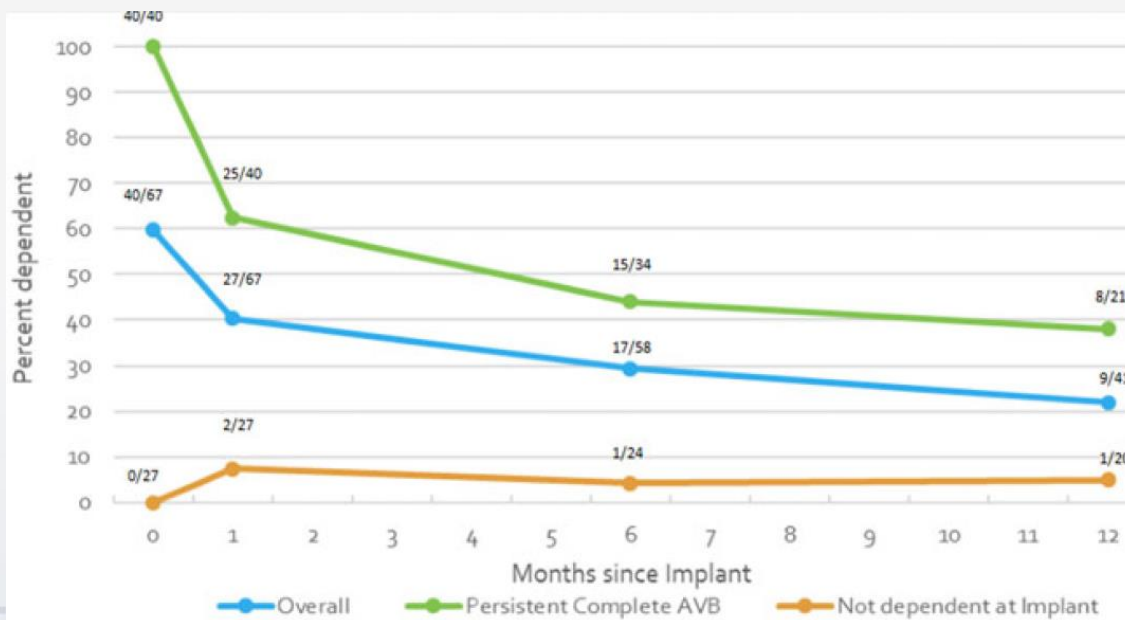
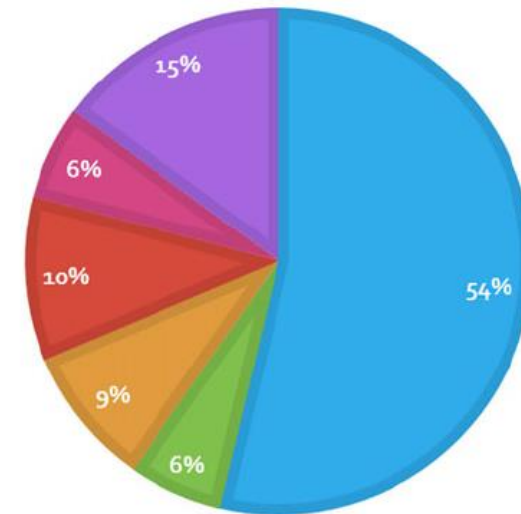
Conduction recovery following pacemaker implantation after transcatheter aortic valve replacement



- 594 consecutive TAVR patients w/o a PPM
- 67 (13%) received a PPM post-TAVR
- PPM dependency = AV block with escape ≤ 40 bpm
- Dependency 40.3% at 30 d, 21.9% at 1 year
- Self-expanding TAVR valve and persistent CHB were predictive of dependency

INDICATIONS FOR PACEMAKER IMPLANTATION

- Persistent complete AV block
- Recurrent intermittent complete AV block
- Transient AV block with LBBB
- Transient AV block without LBBB
- LBBB with prolonging PR interval
- Other

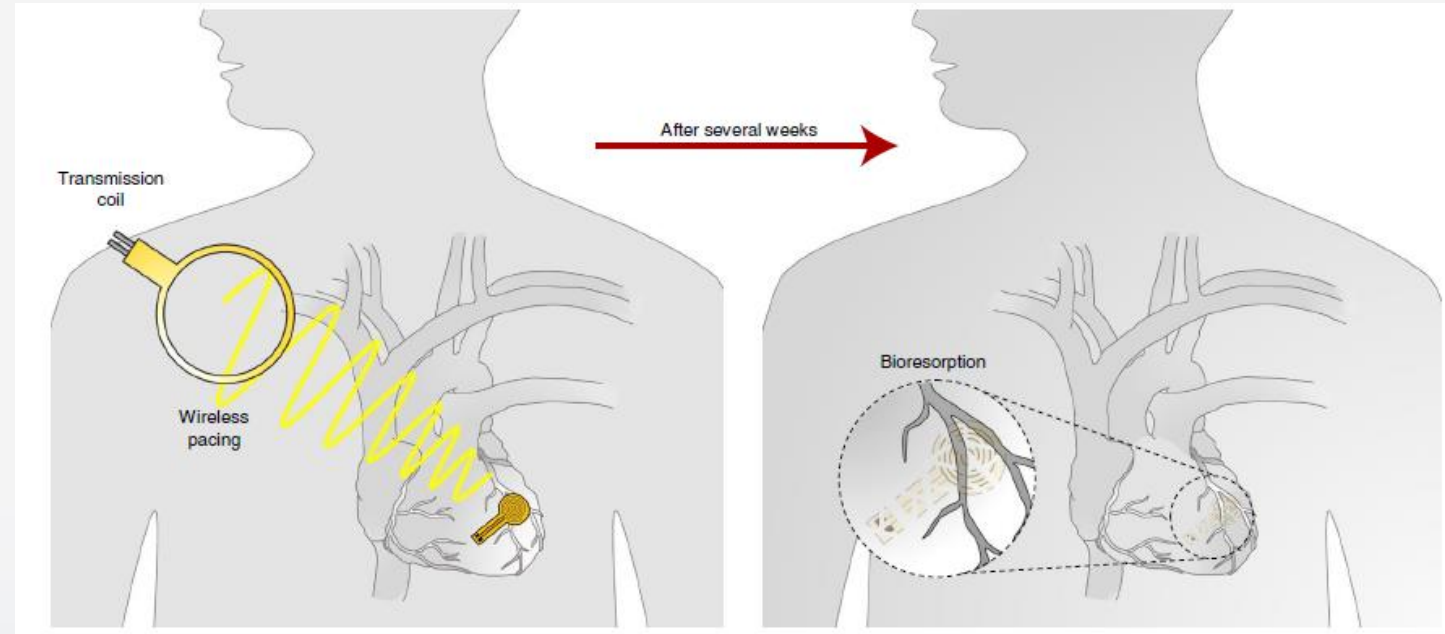
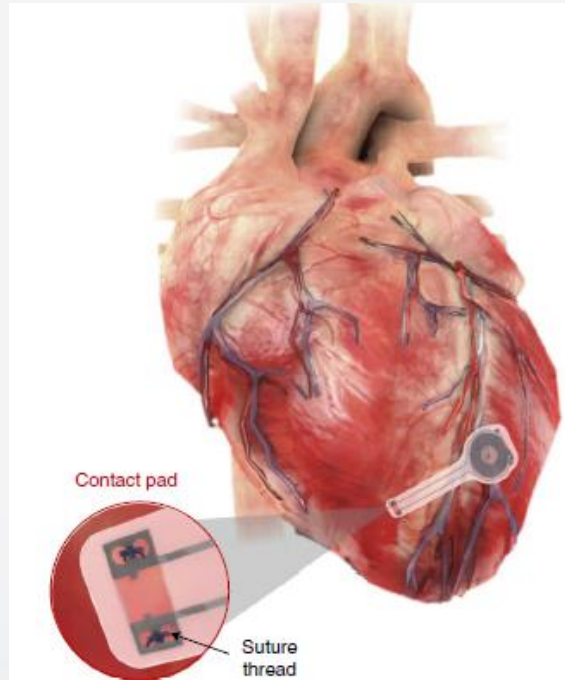


Kaplan et al. 2019;42:146-52

Fully implantable and bioresorbable cardiac pacemakers without leads or batteries

nature
biotechnology

- Designed to replace surgical pacing wires



Conclusions

- TAVR, especially from the transfemoral route, has become a routine outpatient procedure
- Pre-TAVR planning and intra-procedures techniques have improved safety dramatically reduced procedure times
- Next day discharge is now very common and, in selected patients, same day discharge can be considered