**Table 3:** Permanent pacemaker insertion outcomes

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| --- | --- | --- | --- | --- | --- | --- |
| **Author (year)** | **Indication for PPMI** | **Timing of PPMI (days)** | **PPMI rate (%)** | **Mortality at 30 days (%)** | **Predictors (Multivariate)** | **Significant outcomes** |
| Sinhal et al. (2008) | New and complete AVB | 45 ± 23 h of continued dependency on temporary pacing | 6.6 | - | Univariate logistic regression did not identify predictors of PPM requirement | - |
| Hamdan et al. (2015) | New-onset complete AVB; new-onset Mobitz type II AVB; new left bundle branch block with PR interval prolongation; new left bundle branch block with atrial fibrillation with slow ventricular response ; temporary asystole during the procedure in 2 patients | 2.2 +/- 2.1 days | 28.7% | 0% | Membranous septum length (OR = 1.43, 95% CI 1.1-1.8, p=0.002)  Difference between membranous septum length and implantation depth (OR = 1.39, 95% CI 1.2-1.7, p<0.001)  Calcification in basal septum (OR = 4.9, 95% CI 1.2-20.5, p=0.031) | - |
| Bagur et al. (2012) | Complete AVB, severe bradycardia | median = 2 days | 7.3% | - | RBBB | - |
| Urena et al. (2012) | If third-degree or advanced second-degree atrio-ventricular block (AVB) at any anatomical level occurred and was not expected to resolve, or in the presence of sinus node dysfunction and documented symptomatic bradycardia | - | 15.4 % | 6.70% | 30-day PPMI was a protective factor for the occurrence of unexpected (sudden or unknown) death 0.31 (0.11- 0.85) p=0.023 | Stroke:  No PPM = 2.9%, PPM = 4.2%  MI:  No PPM = 1.9%, PPM = 1.3%  Major vascular complications No PPM = 7.2%, PPM = 9.2%;  Life threatening bleeding  No PPM = 15.6%, PPM = 13.8 |
| Ahmad et al. (2019) A | - | - | 4.97% | - | - | Readmission rate at 30 days (OR: 1.19, CI: 0.28 - 4.95, p=0.802) |
| Elchinova et al. (2021) | AV conduction impairment=74.2%  SSS= 16.1% | Median of 305 days after discharge for TAVR | 5.85% | - | First-degree AV block after TAVR (OR 3.13; 95% CI 1.68–5.83; P=.001)  New LBBB after TAVR (OR 2.19; 95% CI 1.19–4.03; P=.011)  Valve-in-valve procedure during follow-up (OR 19.95; 95% CI 4.39–90.75; P=.001) | Conduction disease was the most frequent indication for PPMI before TAVR (75.0%), early before discharge for TAVR (94.1%), and late after TAVI (74.2%), with significant differences among the groups (P=.001) |
| Kostopoulou et al. (2015) | Complete AVB  Type II second-degree AVB  New LBBB in combination with infrahisian conduction delay | 5.4 ± 7 | 24% | 9 | HV interval of 52 ms (sensitivity 75%, specificity 67%) as a cut-off value that showed a trend for PPMI (HR 4.054, 95% CI 0.816–20.138, P = 0.087) | - |
| Leong et al. (2017) | Transient CHB=55.2% LBBB=26.9% Transient CHB + LBBB (combined)=10.4%  Sinus bradycardia (HR < 40) =20.8% Sinus pause=4.5% Transient 2nd degree AV block=4.5% Prophylaxis= 9.0% | 4 days after TAVR | 44.8% | - | Male gender (OR 2.84, 95% CI 1.05–7.69, p = 0.05) and an increase in QRS duration post-TAVR (p = 0.01) | - |
| Mazzella et al. (2020) | HAVB | Early PPMI: 1 day post-TAVR (interquartile range [IQR]: 1–3 days)  Late PPM: median of 7 days post-TAVR (IQR: 6–16.5 days) | 12.1% | - | **Early PPMI:**  Baseline bifascicular block (OR: 42.16; p < .001)  Requiring any pacing on first post-TAVR electrocardiogram (ECG) (OR: 31.55; p < .001) Valve oversizing >15% (OR: 3.61; p < .05)  **Late PPM:**  Baseline RBBB (OR 12.62; p < .001)  History of atrial fibrillation/flutter (OR 4.83; p < .05). | - |
| Nishiyama et al. (2016) | CAVB | - | 22% | - | The ratio of the valve and LVOT area was significantly associated with a higher cumulative risk of events (HR, 3.005 ; 95% CI, 1.034–8.736 ; P b 0.05). | New CLBBB or CAVB: 40% persistent |
| Urena et al. (2012) | HAVB or severe symptomatic bradycardia | - | 9.9% | - | New-onset LBBB following the procedure (HR: 5.99; 95% CI: 2.93 to 15.61; p < 0.001) | - |
| Akin et al. (2012) | CAVB, type II second-degree AV block, and in presence of new LBBB in combination with HV prolongation ≥ 75 ms | - | 51.1 | - | Only new LBBB, QRS duration >120 msec and a PQ interval >200 msec immediately (within 60 minutes) after implantation of the aortic valve were predictors for high-grade (type II second-degree and third-degree) AV block. | - |
| Ferreira et al. (2021) | HAVB=71.4%  Prophylactic implantation due to documented increased HV intervals ≥95−100 ms plus LBBB =9.5%  Infrahisian blocks evidenced during pacing maneuvers (≤150 b.p.m) in the presence of a LBBB=14.3% | - | 28.4 | - | HV after TAVR remained significantly associated with an increased risk of PPMI (OR 1.15 (1.05-1.26) p=0.004) | - |
| Zhang et al. (2021) | - | 5.8 ± 2.8 days | 20.50% | - | Independent predictors of PPMI were new-onset LBBB (coef: 3.211, 95% CI: 0.899–7.467, p = 0.004) and lead I T wave elevation (coef: 11.081, 95% CI: 1.632–28.083, p = 0.016). | - |
| Sharma et al. (2017) | All patients who were pacemaker dependent at 30 days received pacemakers for CHB  For patients who were not pacemaker dependent at 30 days, 70.6% had PPMI for CHB, 17.6% for SSS and 11.8% for new onset LBBB | - | 11.1 | - | - | Predictors for RV pacing dependence at 30 days:  Re-existing RBBB (OR 105.4, 4.52–2458.5, p = 0.0002)  Bifascicular block (OR 12.50, 1.60–97.65, p = 0.02)  Intra- procedural CHB (OR 12.83, 1.26–130.52, p = 0.03)  QRS duration > 120 ms (OR 70.43, 3.23–1535.22, p = 0.0002) on pre-TAVR ECG |
| Pollari et al. (2019) | Symptomatic bradycardia or HAVB (defined as 3rd degree AVB or Mobitz Type II 2nd degree AVB) | - | 7.60% | - | Baseline RBBB [odds ratio (OR) 7.36, 95% CI 2.6–20.6; P < 0.01]  Degree of oversizing (OR 1.04, 95% CI 1.01–1.07 P = 0.02)  prior PCI (OR 2.8, 95% CI 1.1–7.3)  LVOT calcification beneath the non-coronary cusp (OR for an increase of 10 mm3 = 1.06, 95% CI 1–1.1; P = 0.03) were found to be independently associated with permanent AVB and PPMI | - |
| Marzahn et al. (2017) | Third- degree AVB=76.6%  Second- degree AVB=5.5% First-degree AVB with new-onset LBBB=6.9%  Cardiac syncope with new-onset LBBB=0.7%  Bradyarrhythmia absoluta= 5.5%  Sinoatrial node disease=4.1% NOAF with cardiac syncope=0.7% | 89.0% received their PPMI within 30 days after TAVR  11.0% was implanted >30 days after TAVR | 16.9 | - | **Predictors for all-cause mortality:**  LVEF <35% 1.9 CI 1.3-2.9 p=0.002  eGFR <30 2.7 CI 1.7-4.3 p <0.001  AR grade >/= 2 2.1 CI 1.3-3.7 p=0.004 | 45% of PPM patients showed sufficient AV node conduction after PPM reprogramming at follow-up examination |
| Stamou et al. (2019) | - | - | 27.60% | - | **Independent predictors of PPM:**  Age < 70 years (P = .062)  BMI> 30 (P = .0057)  History of AF(P = .0004)  Black race (P = .0078)  Sapien 3 sizes 20 and 23 mm (P < .0001) | Sapien 3 valve size 20/23 mm was associated with higher risk of PPM compared to other valve types. |
| Denegri et al. (2021) | - | - | 20.4 | - | - | Despite higher rates of peri-procedural complications, women presented better survival than men. |
| Cha et al. (2021) | Development of CAVB after TAVR | Within 24 hours; on Day 1; on Days 2-3; on Days 4-5 | Within 24 hours: 72.7%; Day 1: 33.3%; Dyas 2-3: 28.67%; Days 4-5: 20% | - | **Independent predictors of PPM:**  Oversizing index (per 5%): OR 1.630, 95%CI 1.027–2.589, P=0.038  Implantation depth (per mm): OR 1.179, 95%CI 0.962–1.444 , P=0.112  Baseline RBBB: OR 3.748, 95%CI 0.648–21.659, P=0.140  Self or mechanically expandable device: OR 1.702, 95%CI 0.315–9.203, P=0.537 | - |
| Malebranche et al. (2021) | PPM was implanted at the discretion of the attending electrophysiologist for CHB, advanced HAVB, LBBB with progressive QRS widening after TAVR, or in the presence of sinus node dysfunction and documented symptomatic bradycardia | 0-18 days after TAVR | Days 0 and 1: 32%; Day 4: 66%; Day 9: 95%; During inpatient stay: 96%; Following hospital discharge: 4% | - | - | The 2019 consensus algorithm effectively identifies patients not requiring PPM implantation with a negative predictive value of 97.3% |
| Doshi et al. (2018) | - | - | - | New PPM in-hospital mortality: 4.9%  No PPMI in-hospital mortality: 4.0% | **Independent predictors of PPM:**  Female sex (odds ratio [OR]: 1.15, 95% confidence interval [CI]: 1.02–1.30, P = 0.016)  AF (OR: 1.20, 95% CI: 1.07–1.35, P = 0.001)  LBBB (OR: 1.67, 95% CI: 1.38–2.01, P < 0.001)  CAVB (OR: 17.6, 95% CI: 14.5–21.3, P < 0.001)  Type I second-degree AVB (Mobitz type I; OR: 6.12, 95% CI: 1.60–23.37, P = 0.008)  Type II second-degree AVB (Mobitz type II; OR: 1.80, 95% CI: 1.07–3.05, P = 0.026) |  |
| Shivamurthy et al. (2020) | - | - | 9.8 | - | - | Scoring system showed good discrimination with C-statistic score of 0.6743 (95% CI: 0.618-0.729)  Higher scores suggested increased PPM risk.  Patients requiring PPM were older (81.4 versus 78.7 years, P = .002).  Length of stay and in-hospital mortality was significantly higher in PPM group. |
| De Carlo et al. (2012) | CAVB=71.3%  Second-degree Mobitz II AVB =4.5%)  New-onset LBBB and first-degree AVB with marked bradycardia (<45 bpm)=10.6%  New-onset LBBB and first-degree AVB with paroxysmal atrial tachycardia=7.6%  SSS=3.0%  New-onset LBBB in the presence of LVEF <35%=3.0% | - | 24% | Patients who received a PPM and patients who remained in spontaneous rhythm showed similar 30-day overall mortality (1.6% vs 3.4%, P = .44) and cardiac mortality (1.6% vs 2.9%, P = .54). | Independent predictors of PPMI:  Baseline RBBB (odds ratio [OR] 3.72, 95% CI 1.51-9.16, P = .004)  Lower CoreValve implantation (OR 1.16/mm, 95% CI 1.03-1.30, P = .01)  Longer PR interval (OR 1.02, 95% CI 1.00- 1.04, P = .03) | One-year survival was similar between patients who received a PPM and patients who did not receive a PPM (P = .90) |
| Schewel et al. (2018) | LBBB, Third degree AVB, SSS, and First degree AVB + LBBB+HCAV | - | 10.80% | - | Moderate/severe TR (OR 2.05; 95% CI 1.18–3.55; p = 0.010) was identified as an independent predictor for new CAVB after TAVR | - |
| Cresse et al. (2019) | Symptomatic bradycardia progressing to CHB | 4 ± 2 days | 6.7 | - | - | **Increased in PPMI was seen in:**  LBBB (OR 2.77 [95% CI 1.24–6.22)  RBBB (OR 13.2 [95% CI 4.18–41.70])  Change in PR interval greater than 40 ms from baseline (OR = 3.53 [95% CI: 1.49–8.37]) |
| Buellesfeld et al. (2012) | HAV block=62.2%  New- onset LBBB with PR interval prolongation=21.4%  Slow atrial fibrillation=16.3% | 3 days | - | - | - | Periprocedural PPMI did not affect clinical outcomes adversely among patients undergoing transfemoral TAVR |
| Humphries et al. (2012) | - | - | 5.5 | 8.7% | Adjusted OR for 30-day all-cause mortality favored women, 0.39 (95% CI: 0.19-0.80; p=0.01), benefit persisted for 2 years | - |
| Chamandi et al. (2017) | Third-degree or advanced second-degree AVB at any anatomic level  Sinus node dysfunction and documented symptomatic bradycardia | 2 | 19.80% | - | Age [OR 1.02 (1.01–1.04); p = 0.011]  CAD [OR 1.29 (1.03–1.62); p = 0.029]  RBBB [OR 1.27 (1.18-1.38); p = <0.001]  Need for second valve [OR 2.03 (1.10–3.78); p = 0.025]  Days of Hospitalization [OR 1.02 (1.01–1.03); p = 0.014] | **PPMI was associated with:**  Heart Failure Admission [Adjusted HR 1.42 (1.06–1.89), p = 0.019]  Composite of Heart Failure and All-Cause Mortality [Adjusted HR 1.25 (1.05–1.48), p = 0.011] |
| Bhardwaj et al. (2018) | - | - | 11.50% | - | RBBB [25% vs 12%, P = .02] | - |
| De Torres-Alba et al. (2018) | The decision to implant a PM was left to the discretion of the local interdisciplinary team, including valvular heart disease and electrophysiology experts according to current general guidelines | 4 | 12.50% | - | RBBB alone [2.5% vs. 9.2%, p = 0.007]; RBBB + First degree AVB [1.5% vs. 9.2%, p = 0.001] | - |
| Mangieri et al. (2018) | CAVB=77%  Mobitz type II block=7%  Pathological pauses and asystole=6.6%  Symptomatic junctional rhythm=1.8% | 6.1 +- 3.9 days | 8.80% | - | Baseline RBBB (OR: 3.54; 95% CI: 1.07 to 11.77; p= 0.037)  Change in PR interval (OR for each 10-ms increase: 1.31; 95% CI: 1.18 to 1.45; p=0.0001) | All reported outcomes were statistically insignificant (major vascular complications, major bleeding, stroke, TIA, in-hospital mortality) |
| Gonska et al. (2018) | First degree AVB with severely prolonged QT-duration and complete left bundle branch block=7.7%  Second degree AVB type Mobitz II=4.8% Third degree AVB= 70.2% Trifascicular block=2.4% Alternating complete right and left bundle branch block= 3.6% Bradyarrhythmia with atrial fibrillation=10.1 %  Sinus arrest= 0.6% | - | 27.50% | Rate of mortality was low with only 1.1% in the group of patients without PPMI and 1.8% in the group of patients with PPMI (p=0.53) | - | All reported outcomes at 30-days and at 1-year follow-up were statistically insignificant (all-cause mortality, stroke/TIA, myocardial infarction, bleed, aortic dissection, aortic valve thrombosis, endocarditis of the prosthetic aortic valve, new-onset of AF, re-hospitalization |
| Vejpongsa et al. (2018) | - | 2 | 9.97% | - | RBBB [OR 4.42 (2.76-7.07), p<0.001]  LBBB [OR 2.07 (1.48-2.9), p<0.001];  Second degree AVB [OR 10.23 (5.41-19.34), p<0.001]  Bradycardia [OR 4.93 (3.85-6.32), p<0.001]  Transfemoral [OR 1.63 (1.2-2.21), p = 0.002] | No statistical significance in in-hospital mortality between the three groups |
| Sannino et al. (2018) | - | - | 18.4 | Female 2.8%  Male 2.9% | **Favorable clinical outcome was seen in:**  Patients with a STS risk score ≤ 8 (adjusted HR 0.35, 95% CI [0.14 to 0.88], p = 0.026)  Patients treated with first-generation devices (adjusted HR 0.46, 95% CI [0.24 to 0.86], p = 0.016)  Patients treated with balloon-expandable valves (adjusted HR 0.40, 95% CI [0.19 to 0.86], p = 0.019) | - |
| Doshi et al. (2017) | - | - | - | - | - | The composite endpoint of death and stroke occurred more frequently in women than men  Secondary outcomes including stroke, hemorrhage requiring transfusion, pericardial complications were higher in women  Acute renal failure was higher in men  The post-TAVI length of stay was higher in women (8.3 vs. 7.7 days, p=0.0007). |
| Nadeem et al. (2018) | The need for post-procedure PPMI was determined by the electrophysiology consult service | **-** | 21.70% | - | **Patients who had postoperative PPMI were:**  Caucasian (93.2% vs 84.8%; p<0.009)  Had prior CABG (32.9% vs 21.5%; p<0.004)  Active or former smoking history (61.0% vs 50.6%  p<0.026)  Hypertensive (97.3% vs 91.1%; p<0.012)  Have previous atrioventricular conduction defects (26.7% vs 15.2%; p<0.001)  Has RBBB (44.5% vs 9.1%; p <0.001) | Patient who had PPMI had higher readmission rate for HF [HR 1.70 (1.10-2.64), p = 0.019] and for any cause [HR 1.40 (1.11-1.77), p = 0.006] |
| Costa et al. (2019) | 84.8% AVB 4.1% SSS 23.5% Bradycardia | - | 13 | - | **Increased risk of PPMI was seen in:**  Higher valve oversizing (16.3% vs 22.6% by area; OR 1.040 [95% CI: 1.015-1.065]; p<0.01)  Pre-existing RBBB (26.9% vs 5.7%; OR 4.505 [95% CI: 1.976-10.269]; p<0.01) | PPMI associated with increased 6 year mortality  Baseline RBBB increases chance of PPM dependency on follow-up |
| Dolci et al. (2019) | 80% AVB 11% Bradycardia 9% others | 4 | 13 | - | **Increased risk of PPMI was seen in:**  Baseline RBBB QRS width immediately post-TAVR | - |
| Meduri et al. (2019) | Third degree AVB=82% Mobitz type 2 AVB=8% Bifasicular/trifasicular block=6%  Bradycardia 4% | 2 | 34.8 | - | **Increased risk of PPMI was seen in:**  Baseline RBBB Mean depth of valve implantation | - |
| Husser et al. (2019) | AVB=80.2% Bradycardia=16.4% SSS=3.4% | - | 39.2 | 4% | NEO was associated with lower rates of PPMI compared with the S3 (29.6% vs. 43.9%; p 0.025; OR: 0.54; 95% CI: 0.32 to 0.89; p 0.018) | In patients with RBBB PPMI rate was also lower in the NEO versus S3 (23.1% vs. 44.6%; p 0.016; OR: 0.37; 95% CI: 0.17 to 0.78; p= 0.010) |
| Ahmad et al. (2019) B | - | 1.3 | 6.3 | - | PPMI after TAVR were statistically higher in patients who were overweight (OR 12.77, p = 0.024; CI: 1.39 - 17.25) and obese (OR: 15.02, p = 0.036, CI: 1.19 - 19.92) | PPMI patients had higher baseline hemoglobin prior to TAVR (12.9 vs. 12.0; p = 0.021) |
| Wang et al. (2019) | - | - | 7.70% | - | - | - |
| Maeno et al. (2019) | 77.9% AVB 11.5% SSS 10.6% Bradycardia | - | 15.8 | 2.6% | - | Patients with new PPI and low LVEF had higher 2-year cardiovascular mortality after TAVR (hazard ratio, 5.76; P<.001) |
| Du et al. (2020) | Third degree AVB | 8.7 | 15 | 3.3 | RBBB; OR 8.3, 95% CI 2.2–32.1, p < 0.05)  Implantation depth (OR 1.3, 95% CI 1.1–1.5, p = 0.01) were independent predictors of PPMI after TAVR | - |
| D’Ancona et al. (2011) | Postoperative CHB (with ventricular replacement rhythm) or symptomatic bradycardia on the fifth postoperative day | - | 6.2 | 5% (one of 20 patients) in the PPM group and 6.4% (19 of 302 patients) in the non-PPM group (P=0.4). | Only patient age seemed to be correlated to PPMI (P=0.05, odds ratio 1.08; CI 0.9–1.1). | - |
| Hayashida et al. (2012) | - | - | 6.5% | 15 | Male sex (HR: 1.62, 95% CI: 1.03 to 2.53, p = 0.037) was identified as a predictor of midterm mortality by Cox regression analysis | 1-year survival rate was higher for women, 76% (95% CI: 72% to 80%), than for men, 65% (95% CI: 60% to 69%) |
| Ledwoch et al. (2013) | - | - | 33.70% | PPM 6% No PPM 8.1 % | **Independent predictors for PPMI after TAVR:**  No prior valve surgery (OR for prior valve surgery 0.28, 95% CI 0.10–0.82, p<0.02)  Porcelain aorta (OR 1.64, 95% CI 1.11–2.42, p<0.01)  Medtronic CoreValveTM prosthesis (OR 2.86, 95% CI 1.74–4.73, P < 0.0001) | - |
| Buja et al. (2013) | - | - | 19% | - | - | A survival benefit was observed in women (HR 0.27, 95% CI 0.09 to 0.84, p [ 0.02) was seen in women |
| Gensas et al. (2014) | - | - | 25.20% | - | **Independent predictors of PPMI:**  CoreValve vs. Sapien XT (OR, 4.24; 95% CI, 1.56–11.49; p = 0.005)  Baseline RBBB (OR, 4.41; 95% CI, 2.20–8.82; p< 0.001)  Balloon predilatation (OR, 1.75; 95% CI, 1.02–3.02; p = 0.04) | - |
| Nazif et al. (2015) | 79.5% AVB 17.3% SSS | 4.1 +- 4.3 days | 8.80% | PPM=7.5% No PPM= 5.8% | **Predictors of PPMI:**  RBBB (OR: 7.03, 95% CI: 4.92 to 10.06, p < 0.001)  Prosthesis diameter/left ventricular (LV) outflow tract diameter (for each 0.1 increment, OR: 1.29, 95% CI: 1.10 to 1.51, p 0.002)  LV end-diastolic diameter (for each 1 cm, OR: 0.68, 95% CI: 0.53 to 0.87, p 0.003) | Patients requiring PPM had a longer mean duration of post-procedure hospitalization (7.3 2.7 days vs. 6.2 2.8 days, p = 0.001)  At 1 year, new PPM was associated with significantly higher repeat hospitalization (23.9% vs. 18.2%, p 0.05) and mortality or repeat hospitalization (42.0% vs. 32.6%, p = 0.007) |
| Dizon et al. (2015) | 79% AVB 17.3% SSS | - | 8.80% | - | - | New PPM (HR 1.38, 1.00 to 1.89, p=0.05) and prior PPM (HR 1.31, 1.08 to 1.60, p=0.006) were independently associated with 1-year mortality |
| Mouillet et al. (2015) | - | - | 30.30% | PPM 7.9% No PPM 10% | - | - |
| Giustino et al. (2016) | HAVB (third-degree or advanced second-degree atrioventricular block) which was not expected to resolve, or in the presence of sinus node dysfunction and documented symptomatic bradycardia | - | 17.31 | PPM=4.9%  No PPM 5.4% | - | PPMI and postprocedural AR was associated with a negative impact on survival |
| Rodriguez-Olivares et al. (2016) | Third degree atrioventricular block | - | 22.50% | - | **Predictors of PPMI:**  RBBB at baseline (OR 2.9 [1.2–6.9, p = 0.014)  Depth of implantation (OR 1.196 per 1 mm increment, [1.091–1.310], p b 0.001)  LVOT sizing (OR per 1% increment 1.034 [1.005–1.065], p = 0.022) | The more LV outflow tract oversizing, the higher the incidence of PPMI |
| Van Gils et al. (2017) | 99% AVB/ 1% SSS | 2 | 41% | 7 | PPM was more common with Lotus than with the other THVs. | Baseline RBBB was associated with higher PPMI incidence |
| Raelson et al. (2017) | 82% AVB  12% others (HAVB, LBBB, AF with slow ventricular response) | 3 | 9.8 | - | **Predictors of PPMI:**  Age (p=0.014)  RBBB (OR 7.33 [3.64-14.8], p<0.0001)  Atrial fibrillation (OR 2.16 [1.16-4.05], p=0.016)  Self-expanding valves (OR 4.19 [2.20-7.97], p<0.0001 | - |
| Monteiro et al. (2017) | - | - | 20.10% | - | **Predictors of PPMI:**  History of RBBB (OR, 6.19; 3.56–10.75; p ≤ 0.001)  Use of CoreValve® prosthesis (OR, 3.16; 1.74–5.72; p ≤ 0.001)  Baseline transaortic gradient > 50 mm Hg (OR, 1.86; 1.08–3.2; p = 0.025) | - |
| Gaede et al. (2018) | 90% AVB/8% SSS/2% Bradycardia | 4 | 14.7 | - | **Predictors of PPMI:**  Preexisting RBBB MCV prosthesis | **Predictors of lack of recovery of AVB:** Prior RBBB Higher mean aortic valve gradient |
| Gonska et al. (2016) | Second degree AVB Mobitz II or third degree AVB | 4.25 +- 3.3 | 18.40% | - | Independent predictors of PPMI:  Baseline first degree AVB (OR 3.9, 95% CI 1.73–9.10, p < 0.01)  Preprocedural complete RBBB (OR 4.5, 95% CI 1.50– 13.21, p < 0.01) | Patients requiring PPMI more often had first degree atrioventricular block (AVB) at baseline (48.7 vs. 16.5%, p < 0.01), preprocedural complete right bundle branch block (RBBB; 25.0 vs. 3.9%, p<0.01) and higher calcium volume of the aortic valve (258.5 ± 317.3 vs. 163.6 ± 178.8 mm3, p < 0.01) |
| Pellegrini et al. (2018) A | 71.3% AVB 5.2% SSS 23.5% Bradycardia | - | 16.2 | 1.6 | Independent predictor of new PPI:  Prosthesis oversizing (per each % increase) (OR, 1.028; 95%CI, 1.005- 1.051; P = .017) independent of implantation depth | - |
| Pellegrini et al. (2018) B | 71.5% AVB 3.5% SSS 25% Bradycardia | - | 9.9 | - | logistic EuroSCORE (OR, 1.039; 95%CI, 1.008-1.071; P = .013) persisted as an independent predictor of PPMI/new-onset CA | - |
| Fadahunsi 2016 | - | 3 | 6.7 | - | - | - |

**Abbreviation:** AF=atrial fibrillation; AR=Aortic regurgitation; AV=Atrioventricular; AVB=atrioventricular block; BMI=body mass index; CAD=Coronary artery disease; CAVB=Complete AV block ; CHB=complete heart block; CI=confidence interval;; ECG=Electrocardiogram; h=hour; HAVB=high degree AV block; HV=His bundle to ventricular myocardium; LBBB=left bundle branch block; LVOT=left ventricular outflow tract; MCV=Medtronic core valve; MI=myocardial infarction; mm=millimeter; ms=milliseconds; NOAF=new onset atrial fibrillation; OR=odds ratio; PPMI=permanent pacemaker insertion; PPM=permanent pacemaker; RBBB=right bundle branch block; RV=right ventricle; SSS=sick sinus syndrome; TAVR=Transcatheter aortic valve replacement; TIA=transient ischemic attack; TR=Tricuspid regurgitation