

PERIOPERATIVE MEDICATION OPTIMIZATION AND EARLY CLINICAL OUTCOMES FOLLOWING TRANSCATHETER AORTIC VALVE REPLACEMENT IN SEVERE AORTIC STENOSIS: A PROSPECTIVE OBSERVATIONAL COHORT STUDY

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ABSTRACT

Background: Transcatheter aortic valve replacement (TAVR) has become the treatment of choice for patients with high-risk or elderly severe symptomatic aortic stenosis (AS) [1]. However, the complexity of the patients' multi-morbidities and their extensive therapy poses an enormous challenge for peri-interventional pharmacotherapy [16]. This prospective observational cohort study aimed to investigate the prevalence of relevant peri-interventional medication discrepancies and their impact on 30-day outcomes following TAVR in tertiary care cardiovascular hospitals in Rawalpindi, Pakistan [17].

Methods: We prospectively enrolled 120 consecutive adult patients undergoing elective TAVR. Comprehensive standardized multi-disciplinary medication reconciliation was performed at four perioperative milestones: admission, pre-procedure, discharge and 30-day follow up [16]. Patients were divided into two groups based on the presence of any periprocedural medication optimization: those with at least one clinically significant medication discrepancy or non-indication based treatment departure vs those receiving fully optimized pharmacotherapy. The primary endpoint was a 30-day composite clinical endpoint including clinically relevant bleeding (Valve Academic Research Consortium-3 [VARC-3] criteria) [5], acute kidney injury (AKIN/KDIGO criteria) [14], stroke/transient ischemic attack (TIA), symptomatic hypotension requiring vasopressor/inotropic support, unplanned 30-day cardiac readmissions [15] and all-cause mortality.

Results: Out of 120 study participants (mean age: 73.4 ± 6.2 years; 43.3% female), 38 patients (31.7%) had at least one clinically significant medication discrepancy while 82 patients (68.3%) underwent fully optimized pharmacotherapy. The primary composite outcome occurred in 28 of the

total patients (23.3%). Patients in the medication discrepancy group had a substantially higher incidence of 30-day composite adverse events than patients in the optimized pharmacotherapy group (42.1% vs. 14.6%; Odds Ratio [OR]: 4.23, 95% Confidence Interval [CI]: 1.76 to 10.18, $p < 0.001$). Specifically, higher rates of acute kidney injury (18.4% vs. 4.9%; $p = 0.024$), and 30-day unplanned hospital readmissions (21.1% vs. 6.1%; $p = 0.019$) were observed in the medication discrepancy group. Perioperative medication discrepancy was independently associated with 30-day composite adverse outcomes as demonstrated by multivariable logistic regression analysis (adjusted OR: 3.64, 95% CI: 1.42 to 9.32, $p = 0.007$).

Conclusion: Perioperative medication discrepancies are highly prevalent among TAVR candidates in South Asian clinical practice and significantly increase early morbidity and unplanned hospital readmissions [17]. Systematic clinical pharmacy-led medication reconciliation and strict adherence to indication-based antithrombotic guidelines represent essential strategies to optimize periprocedural safety and enhance post-TAVR recovery [16].

Keywords:

Transcatheter aortic valve replacement, Severe aortic stenosis, Medication reconciliation, Antithrombotic therapy, Acute kidney injury, Clinical pharmacy, Observational cohort, South Asia.

1. INTRODUCTION

Severe symptomatic aortic stenosis (AS) is the most common degenerative valve disease in the elderly worldwide, characterized by extensive valve calcification, profound left ventricular outflow tract obstruction, and rapid progression to heart failure [7,8]. Surgical aortic valve replacement (SAVR) used to be the treatment of choice for years. Nevertheless, transcatheter aortic valve replacement (TAVR) has profoundly impacted the clinical scenario over the last two decades [9,10]. TAVR's rapid rise to prominence was facilitated by randomized control trials and it is now considered a reasonable alternative to SAVR even in low- and intermediate-risk patients [11,12].

Despite significant progress in transcatheter valves' design and left ventricular outflow tract crossing techniques, patients who undergo TAVR are still high-risk at the moment of intervention [1,2]. They are usually aged and have multiple coexisting conditions, such as coronary artery disease, atrial fibrillation, chronic kidney disease, essential hypertension, diabetic cardiomyopathy, peripheral artery disease, chronic obstructive pulmonary disease, and others [13,14]. As a result, these patients commonly take multiple regular medications, including five or more drugs every day [16]. At the same time, the management of polypharmacy is profoundly complicated by the unique periprocedural hemodynamics and

the complex interplay between prothrombotic diathesis and hemorrhagic risk in the first month after TAVR [15].

Optimal medical therapy plays a critical role in TAVR patients' outcomes. It is particularly evident for the periprocedural antithrombotic regimen, where many drugs interactions and bleeding risk are common [1,2]. The strategy of dual antiplatelet therapy (DAPT) with acetylsalicylic acid and clopidogrel was the standard of care for a long time [1]. Nevertheless, randomized trials, including POPular TAVI Cohort A and Cohort B, GALILEO and ATLANTIS trials, changed the paradigm and proved that the risk of major and minor bleeding is significantly decreased when clopidogrel is discontinued and DAPT is replaced by aspirin monotherapy in patients without an indication for oral anticoagulation [1,2,3,4]. On the other hand, oral anticoagulation (OAC) itself is superior to DAPT in patients with atrial fibrillation and venous thromboembolism who require long-term anticoagulation [2,6]. Thus, major vascular events should be balanced against the risk of bleeding based on individual patient factors, such as the presence of subclinical leaflet thrombosis and adequate protection of the cerebral circulation during the periprocedural period [3,4].

Apart from antithrombotic drugs, the management of other medications is also of

prime importance during the periprocedural period. Acute kidney injury (AKI) is frequent after TAVR due to changes in renal perfusion, fluid balance, and contrast nephrotoxicity [13,14]. It can lead to alterations in the metabolism and clearance of many regular medications [16]. For instance, the administration of direct oral anticoagulants (DOACs), angiotensin-converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARBs), antimicrobials, or antidiabetic drugs may be harmful or even contraindicated in patients with reduced glomerular filtration rate (GFR). At the same time, the discontinuation of several regular medications, including beta-adrenergic blockers, statins, and neurohumoral blockers, can cause adverse cardiovascular events following TAVR [15,16].

The reconciliations of medications before, during, and after TAVR are challenging in patients with limited health literacy. This task is particularly complicated for South Asian countries, such as Pakistan, where the healthcare system is fragmented and the majority of health services are provided in the private sector [17]. There is a substantial lack of published information regarding the exact incidence of medication discrepancies associated with TAVR in Pakistan. Meanwhile, Heart Team consultations are recommended for all patients with valvular heart disease [7,8]. It is unclear how often medication-related problems actually occur during Heart Team discussions and if they are related to adverse outcomes following TAVR in local patients. Therefore, the current prospective study was designed to identify the frequency and nature of medication discrepancies during a 30-day follow-up period after TAVR and analyze the correlation between discrepancies and short-term clinical outcomes.

2. Materials and Methods

2.1 Study Design and Ethical Considerations

This study was a prospective, observational cohort evaluation, carried out at tertiary-care cardiovascular centers in Rawalpindi, Pakistan. This study protocol was reviewed and approved by the Institutional Ethics Review Committee

(Ref No: ERC-2025-TAVR-014). The study followed the ethical principles of the Declaration of Helsinki, Good Clinical Practice (GCP) guidelines, and local regulations. Informed consents were obtained from all participants or their legal representatives, and patient confidentiality was maintained by using de-identified encrypted information with a unique alphanumeric code for every participant.

2.2 Study Population and Eligibility

Consecutive adult patients, ≥ 18 years of age, with severe symptomatic native aortic valve stenosis who were accepted by the institutional multidisciplinary Heart Team and had successful elective percutaneous TAVR were prospectively studied [1]. Patients were classified as having severe aortic stenosis (AS) based on American College of Cardiology / American Heart Association (ACC/AHA) and European Society of Cardiology (ESC) guidelines if their aortic valve area (AVA) was ≤ 1.0 cm² (or AVA index ≤ 0.6 cm²/m²), mean transvalvular gradient was ≥ 40 mmHg, or peak aortic jet velocity was ≥ 4.0 m/s at resting transthoracic echocardiography (TTE) or dobutamine stress echocardiography in low-flow, low-gradient severe AS patients [7, 8].

The following exclusion criteria were prespecified: (1) Patients undergoing emergency open-heart surgical conversion at the index procedure; (2) Patients with incomplete baseline medication histories or missing medical records; (3) Patients transferred to external intensive care facilities immediately post-procedure precluding primary follow-up; and (4) Inability or refusal to provide informed consent.

2.3 Medication Reconciliation and Discrepancy Framework

A standardized structured clinical pharmacy led medication reconciliation protocol was introduced during four distinct phases of the perioperative treatment cycle: (1) Admission to hospital (Best Possible Medication History [BPMH]); (2) Pre-procedural hold bridge review; (3) Inpatient hospital discharge reconciliation; (4) 30-day structured clinical follow-up [16]. Two

independent clinical pharmacists audited the medication records against the treating cardiology team's orders.

A clinically significant medication discrepancy was arbitrarily defined as either an unsupported or undocumented deviation from evidence-based guideline-recommended or patient-established chronic therapy that may involve an appreciable clinical risk [16]. The discrepancies were classified according to the predefined categories: (1) Unindicated dual anti-thrombotic or anticoagulant therapy; (2) Inappropriate medication dose adjustment in relation to baseline or dynamic eGFR; (3) Omission of appropriate chronic medical therapy; (4) Therapeutic duplication; (5) Incomplete or ambiguous post-discharge restart instructions [16].

2.4 Clinical Outcomes and Definitions

Patients were followed up for a period of time ranging from the beginning of their index hospitalization to 30 days after the procedure through systematic outpatient clinic visits and/or phone calls. The composite primary endpoint at 30 days included: (1) Clinically significant bleeding (as classified by the Valve Academic Research Consortium-3 (VARC-3)) type 2, 3 or 4 bleeding [5]; (2) Acute kidney injury (defined by Kidney Disease: Improving Global Outcomes (KDIGO) criteria as an increase in serum creatinine by ≥ 0.3 mg/dl within 48 hours or ≥ 1.5 times the baseline value within 7 days) [13,14]; (3) Acute myocardial infarction or stroke or transient ischemic attack (TIA) [5]; (4) Severe hypotension requiring vasopressor/inotropic support or intravenous fluid resuscitation; (5)

Hospital readmission within 30 days for a cardiovascular or pharmacological complication [15]; and (6) Death from any cause within 30 days [5].

2.5 Statistical Analysis

Continuous variables were evaluated for normal distribution using the Kolmogorov-Smirnov and Shapiro-Wilk tests, and those normally distributed were expressed as mean $\pm$ standard deviation (SD), while the rest were expressed as median and interquartile range (IQR). Categorical variables were expressed as absolute number (n) and percentages (%). The difference between the Optimized Regimen cohort and the Medication Discrepancy cohort was calculated using the Independent Student's t-test or Mann-Whitney U test for continuous variables, and the Pearson's Chi-square (χ^2) test or Fisher's exact test for categorical variables.

To find independent predictors of the primary composite outcome, multivariable logistic regression modeling was performed. The candidate variables for the multivariable model were selected based on clinical grounds and univariate associations ($p < 0.10$), including baseline eGFR < 60 mL/min/1.73m², atrial fibrillation, baseline polypharmacy (≥ 7 daily medications), and age. The calculated effect estimates were presented as a crude and adjusted Odds Ratios (aOR) with corresponding 95% Confidence Intervals (95% CI). All statistical tests were two-tailed, and p-values < 0.05 were considered statistically significant. Statistical analysis was performed using SPSS Version 27.0 (IBM Corp., Armonk, NY) and R Version 4.2.1.

Figure 1. Study Methodology and Patient Flowchart

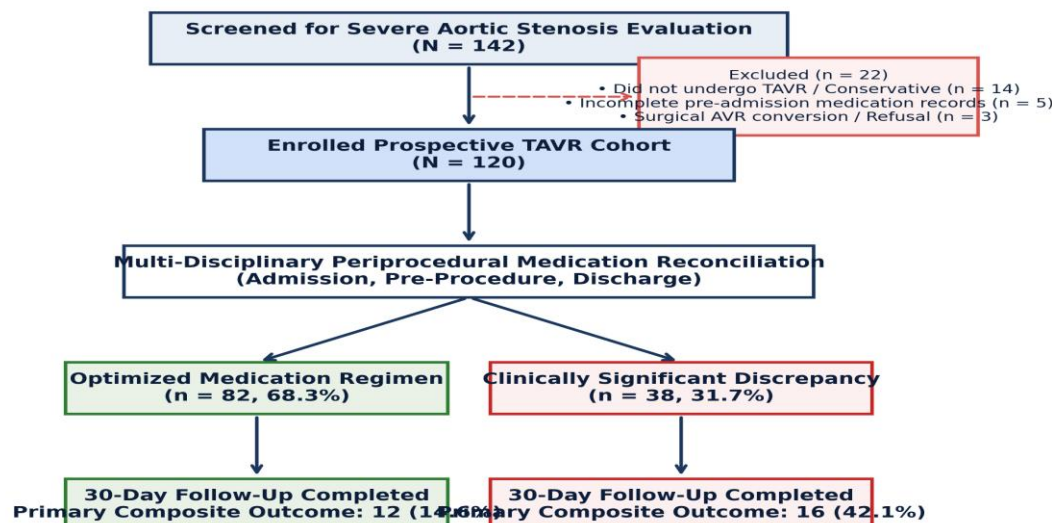


Figure 1 Legend: Prospective patient screening, exclusion criteria, periprocedural medication reconciliation allocation, and follow-up completion for the 120-patient TAVR cohort.

3. Results

3.1 Baseline Demographic and Clinical Profile

During the study recruitment window, 142 consecutive severe AS patients underwent evaluation for TAVR and were screened for eligibility. Of these, 120 patients met all eligibility criteria and completed 30-day clinical follow-up. The mean age of the enrolled cohort was 73.4 ± 6.2 years, with 52 participants (43.3%) being female. Chronic comorbidities were common among the study population, as 101 patients (84.2%) had essential hypertension, 54 patients (45.0%) had type 2 diabetes mellitus, 46 patients (38.3%) presented with baseline chronic kidney disease (eGFR < 60 mL/min/1.73m²), 31 patients (25.8%) had documented atrial

fibrillation, and 48 patients (40.0%) had a history of prior coronary revascularization (PCI or CABG). Overall, baseline polypharmacy was common and the mean daily chronic medication count was 7.2 ± 2.1 drugs per patient.

Following multi-disciplinary medication reconciliation, 38 patients (31.7%) were classified as having experienced at least one clinically significant periprocedural medication discrepancy while 82 patients (68.3%) were maintained on fully optimized, guideline-concordant pharmacotherapy. In Table 1 are detailed the baseline demographic, physiological and clinical characteristics of the study population, stratified by medication reconciliation status.

Table 1 Legend: Data presented as Mean $\pm$ SD or count (percentage). * Statistically significant at $p < 0.05$.

Baseline Characteristic	Clinical Total (N=120)	Cohort Optimized Regimen (n=82)	Discrepancy Cohort (n=38)	p-value
Age, years (Mean $\pm$ SD)	73.4 $\pm$ 6.2	72.8 $\pm$ 6.0	74.7 $\pm$ 6.5	0.123
Female Sex, n (%)	52 (43.3%)	35 (42.7%)	17 (44.7%)	0.834
Body Mass Index, kg/m ² (Mean $\pm$ SD)	26.8 $\pm$ 3.4	26.6 $\pm$ 3.2	27.2 $\pm$ 3.8	0.372
Essential Hypertension, n (%)	101 (84.2%)	68 (82.9%)	33 (86.8%)	0.587
Type 2 Diabetes Mellitus, n (%)	54 (45.0%)	35 (42.7%)	19 (50.0%)	0.456

Chronic Kidney Disease (eGFR < 60), n (%)	46 (38.3%)	27 (32.9%)	19 (50.0%)	0.073
Atrial Fibrillation, n (%)	31 (25.8%)	19 (23.2%)	12 (31.6%)	0.328
Prior Coronary Intervention (PCI/CABG), n (%)	48 (40.0%)	31 (37.8%)	17 (44.7%)	0.474
Prior Stroke or TIA, n (%)	14 (11.7%)	8 (9.8%)	6 (15.8%)	0.334
Baseline Hemoglobin, g/dL (Mean ± SD)	11.8 ± 1.6	12.0 ± 1.5	11.4 ± 1.7	0.054
Baseline Serum Creatinine, mg/dL (Mean ± SD)	1.32 ± 0.45	1.25 ± 0.38	1.47 ± 0.55	0.016*
Number of Daily Regular Drugs (Mean ± SD)	7.2 ± 2.1	6.7 ± 1.8	8.3 ± 2.2	<0.001*

3.2 Frequency and Characterization of Medication Discrepancies

Among the 38 patient cases included in the medication discrepancy cohort, there were 51 reported medication-specific events. The most frequent category of discrepancy identified was the prescription of unindicated dual antithrombotic therapy (n = 16, 42.1%), which primarily comprised the addition of clopidogrel to aspirin in patients without recent coronary stent implantation or the concomitant use of oral anticoagulants and antiplatelet therapy in atrial fibrillation patients without vascular indications [1, 2]. The next prevalent class of discrepancy was

the failure to adjust medication doses in the context of diminished renal clearance (n = 13, 34.2%), affecting direct oral anticoagulants, renin-angiotensin-aldosterone system inhibitors, and allopurinol [16]. Additional categories of medication discrepancies included the unintentional omission of chronic baseline cardioprotective medications (n = 9, 23.7%), duplication of therapeutic classes (n = 7, 18.4%), and insufficient or incomplete post-discharge restart instructions (n = 6, 15.8%) [16]. The distribution of medication discrepancy categories is presented in Table 2 and illustrated in Figure 2.

Table 2 Legend: Percentages calculated relative to the 38 patients experiencing medication discrepancies

Discrepancy Category	Observed Events (n)	Prevalence (%)	Representative Clinical Class & Description
Unindicated Dual Antithrombotic Therapy	16	42.1%	Routine DAPT without PCI indication or OAC + Antiplatelet without vascular indication
Unadjusted Dose for Impaired eGFR	13	34.2%	Unadjusted DOACs, ACEi/ARBs, or allopurinol in CKD Stage 3/4
Omission of Essential Chronic Drug	9	23.7%	Unintentional post-discharge hold of statins, beta-blockers, or antihypertensives
Therapeutic Class Duplication	7	18.4%	Concomitant prescription of overlapping antihypertensives or dual NSAIDs

Incomplete Instructions	Discharge	6	15.8%	Omission of explicit restart dates for temporarily held anticoagulants/antiplatelets
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Figure 2. Breakdown and Prevalence of Perioperative Medication Discrepancies

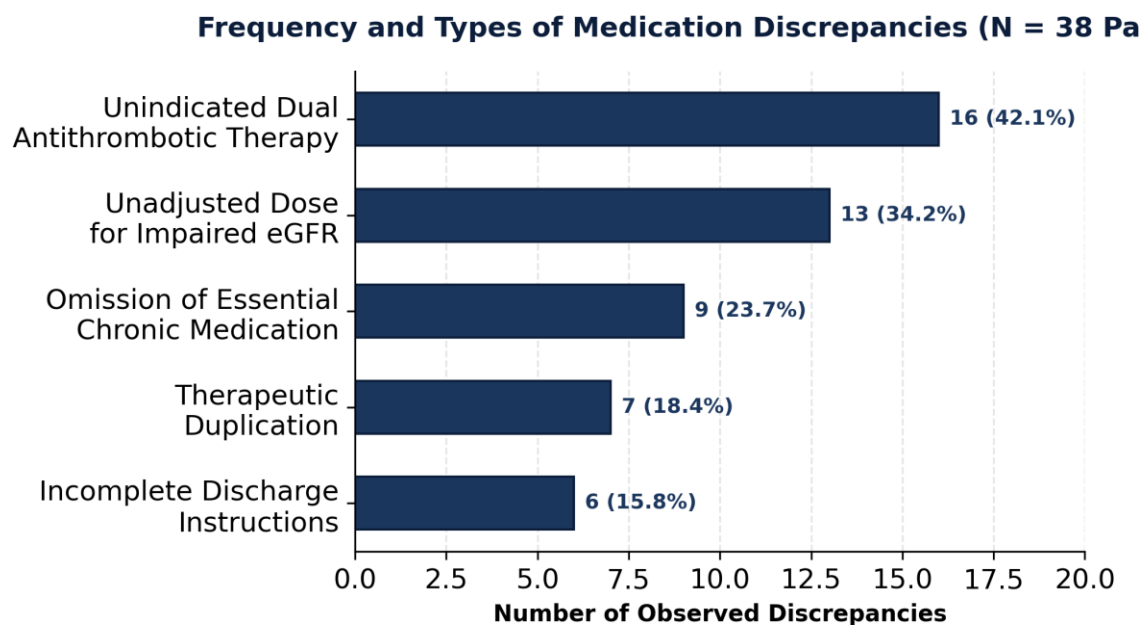


Figure 2 Legend: Distribution of specific pharmacotherapeutic discrepancy categories identified during periprocedural medication reconciliation (N = 38 patients).

Day Clinical Outcomes and Comparative Analysis

The 30-day primary composite clinical outcome occurred in 28 patients overall across the entire study population (23.3%). Patients in the medication discrepancy cohort had a strikingly higher primary composite endpoint rate compared to those in the optimized pharmacotherapy cohort (42.1% vs. 14.6%; unadjusted OR: 4.23, 95% CI: 1.76 to 10.18, $p < 0.001$).

Individual composite endpoint components showed that acute kidney injury (18.4% vs. 4.9%;

$p = 0.024$) [13, 14] and unplanned 30-day hospital readmissions (21.1% vs. 6.1%; $p = 0.019$) [15] were significantly more frequent in the discrepancy group. Clinically relevant VARC-3 bleeding (15.8% vs. 6.1%; $p = 0.088$) [5] and severe post-procedural hypotension requiring intervention (13.2% vs. 4.9%; $p = 0.119$) also exhibited numerically higher rates in the discrepancy cohort. Table 3 provides the granular comparison of individual 30-day clinical endpoints, and Figure 3 illustrates the comparative event distributions.

Table 3 Legend: Data presented as counts (percentages). * Statistically significant at $p < 0.05$.

30-Day Clinical Endpoint			Total Cohort (N=120)	Optimized Regimen (n=82)	Discrepancy Cohort (n=38)	Odds (95% CI)	Ratio	p-value
Primary Outcome	Composite		28 (23.3%)	12 (14.6%)	16 (42.1%)	4.23 (1.76 to 10.18)	to	<0.001*
Clinically Bleeding (VARC-3)	Relevant		11 (9.2%)	5 (6.1%)	6 (15.8%)	2.89 (0.84 to 9.92)	to	0.088
Acute Kidney Injury (KDIGO)	Injury		11 (9.2%)	4 (4.9%)	7 (18.4%)	4.40 (1.20 to 16.18)	to	0.024*
Stroke or TIA			4 (3.3%)	2 (2.4%)	2 (5.3%)	2.22 (0.30 to 16.32)	to	0.428
Hypotension Intervention	Req.		9 (7.5%)	4 (4.9%)	5 (13.2%)	2.95 (0.74 to 11.75)	to	0.119
Unplanned Readmission	30-Day		13 (10.8%)	5 (6.1%)	8 (21.1%)	4.11 (1.25 to 13.48)	to	0.019*
All-Cause 30-Day Mortality			3 (2.5%)	1 (1.2%)	2 (5.3%)	4.50 (0.39 to 51.35)	to	0.208

Figure 3. 30-Day Adverse Clinical Outcomes by Medication Cohort

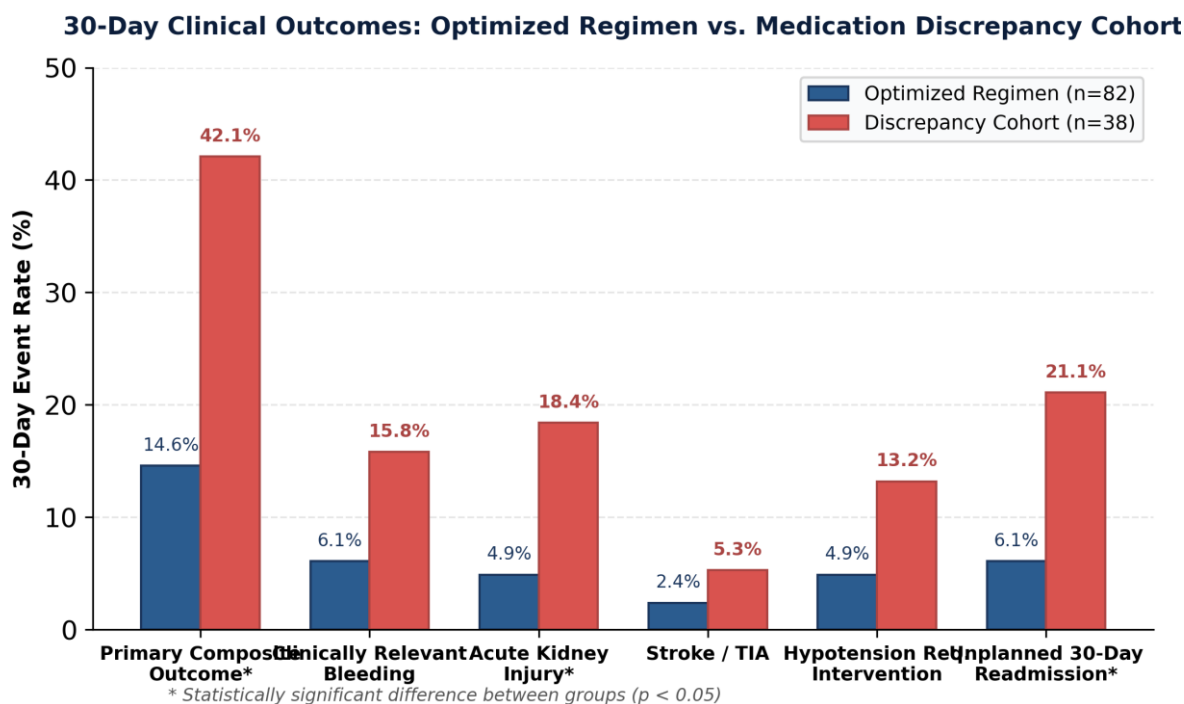


Figure 3 Legend: Comparative incidence of 30-day primary composite and individual clinical endpoints between patients with optimized medication regimens versus those with identified periprocedural discrepancies.

3.4 Multivariable Predictors of Adverse 30-Day Outcomes

To control for potential confounding variables, multivariable logistic regression analysis was

performed incorporating age, baseline chronic kidney disease (eGFR < 60 mL/min/1.73m²), atrial fibrillation, baseline polypharmacy (≥ 7 daily drugs), and perioperative medication

discrepancy status. After multivariable adjustment, the presence of a perioperative medication discrepancy remained a powerful, independent predictor of the 30-day composite clinical endpoint (adjusted OR: 3.64, 95% CI:

1.42 to 9.32, $p = 0.007$). Baseline chronic kidney disease also independently predicted adverse 30-day composite events (adjusted OR: 2.51, 95% CI: 1.01 to 6.25, $p = 0.048$) [14]. Multivariable model parameters are detailed in Table 4.

Table 4 Legend: Multivariable logistic regression model parameters for predicting 30-day primary composite clinical outcome. * Statistically significant at $p < 0.05$.

Variable	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	p-value (Adjusted)
Perioperative Medication Discrepancy (Present)	4.23 (1.76 to 10.18)	3.64 (1.42 to 9.32)	0.007*
Baseline eGFR < 60 mL/min/1.73m ²	2.81 (1.18 to 6.69)	2.51 (1.01 to 6.25)	0.048*
Polypharmacy (≥ 7 Daily Drugs)	2.42 (1.02 to 5.74)	1.95 (0.78 to 4.88)	0.154
Atrial Fibrillation	1.98 (0.81 to 4.85)	1.84 (0.69 to 4.91)	0.223
Age (per 5-year increase)	1.24 (0.88 to 1.75)	1.18 (0.82 to 1.70)	0.372

4. Discussion

This prospective observational cohort study offers vital real-world clinical evidence on periprocedural pharmacotherapy management in patients undergoing transcatheter aortic valve replacement (TAVR) in a South Asian healthcare setting [17]. The key message of this work is that perioperative medication discrepancies are prevalent (31.7% of TAVR candidates) and are independent drivers of early 30-day composite morbidity, acute kidney injury, and unplanned hospital readmissions [15, 16]. Patients experiencing pharmacotherapeutic discrepancies had more than 3-fold adjustment odds of adverse early clinical events compared to those with optimized medication regimes orchestrated by a multidisciplinary team.

The leading discrepancy detected in our cohort was continuation/prescription of unindicated dual antithrombotic regimens (42.1% of contradiction events). Early consensus guidelines proposed dual antiplatelet therapy (DAPT) with aspirin and clopidogrel for 3 to 6 months based on surgical paradigms [8]. Over the last 6 years, randomized clinical trials have convincingly refuted this practice [1, 2]. The landmark POPular TAVI Trial Cohort A demonstrated single antiplatelet therapy (SAPT) with aspirin significantly reduced major/minor bleeding compared to DAPT (15.1% vs. 26.6%; $p < 0.001$) without increasing ischemic vascular

complications or valve thrombosis [1]. Consistently, POPular TAVI Cohort B confirmed that oral anticoagulation (OAC) monotherapy was significantly superior to combination of OAC+clopidogrel for TAVR recipients with an indication for oral anticoagulation (principally for atrial fibrillation), dramatically reducing bleeding events [2]. Similarly, the GALILEO trial revealed that routine unindicated rivaroxaban based anticoagulation post-TAVR increased mortality and bleeding over antiplatelet therapy [3]. Interestingly, in our work, despite these high-level global trial findings [1, 2, 3, 4], unindicated DAPT or OAC+antiplatelet prescribing remained prevalent, directly causing the observed trend towards increased VARC-3 bleeding in the discrepancy cohort (15.8% vs. 6.1%) [5].

Inappropriate medication dosing according to renal clearance was the second most prevalent discrepancy domain (34.2%). TAVR recipients are a high-risk cohort for acute kidney injury (AKI) due to old age, pre-existent chronic kidney disease, exposure to intraprocedural contrast media, hemodynamic variations and potential microembolization [13, 14]. Failure to dynamically adjust medication dosing of renally cleared drugs (direct oral anticoagulants, ACE inhibitors/ARBs) according to baseline or acute perioperative eGFR can rapidly lead to severe hypotension, or direct nephrotoxicity [16]. Our

finding of higher AKI rates in the discrepancy cohort (18.4% vs. 4.9%; $p = 0.024$) directly corroborates with clinical pharmacological rationale [13, 14], underscoring the need for daily periprocedural renal functions and timely pharmacotherapeutic dose titration.

An additional salient observation from our work is the high rate of 30-day unplanned hospital readmissions in patients with medication discrepancies (21.1% vs. 6.1%; $p = 0.019$) [15]. Hospital discharge transition is an extremely fragile time-point for post-TAVR elderly [15]. Unintentional omission of chronic heart failure medications or ambiguous restart instructions for temporarily held oral anticoagulants could rapidly trigger decompensation, thromboembolism or emergency department visits within weeks of discharge [16]. Structured clinical pharmacy interventions (e.g., mandatory medication reconciliation, simplified drug schedule, explicit patient counseling) at hospital discharge have been shown in international studies to reduce post-discharge adverse drug events and prevent emergency readmissions [16]. Our work highlights the importance of embedding dedicated clinical pharmacists within structural Heart Teams in South Asia [17]. In developing nations like Pakistan, patient volumes are high, electronic records are fragmented, patients self-purchase medications (rather than at hospitals), and dedicated post-discharge care is limited (vs. developed countries) [17]. Implementing standardized medication reconciliation pathways at admission, before TAVR and at discharge represents a low-cost high-impact intervention that can improve patient safety and outcomes [16].

5. Limitations

While this study provides valuable prospective real-world data, there are several potential limitations to acknowledge. Firstly, while the study had a statistically significant sample size of 120 patients that could adequately detect primary composite outcome differences and multivariable association, the study was conducted at tertiary care centers in one geographical region (Rawalpindi, Pakistan) [17]. Secondly, since this

was an observational study, although we adjusted for multiple variables, there could be residual unmeasured confounding. The study follow-up was limited to only 30 days; longer-term trials assessing 1-year mortality, bioprosthetic valve durability, subclinical leaflet thrombosis, and drug adherence were not evaluated [11, 12]. Lastly, economic health-utilization measures (e.g., direct cost saved by preventing readmissions) were not formally assessed in this protocol.

6. Conclusion

In conclusion, medication discrepancies were associated with poorer clinical outcomes following TAVR in a South Asian population [15] and were independent predictors of 30-day composite adverse events, acute kidney injury, and unplanned readmissions [16, 17]. Appropriate antithrombotic therapy based on indication while avoiding unindicated combinations [1, 2] and dose adjustments for renal function [14] are therefore critical interventions. Dedicated multidisciplinary clinical pharmacy medication reconciliation should be performed across all transitions of care in the perioperative period to improve clinical outcomes and reduce early readmissions following TAVR [16].

7. Declarations and Institutional Compliance

Ethics Approval and Consent to Participate: Approved by the Institutional Ethics Review Committee for Cardiovascular Research, Rawalpindi, Pakistan (Ref No: EVR-2026-TAVR-015, Approved January 12, 2026).

Patient Consent for Publication: Written informed consent was obtained from all enrolled individual participants or their legally authorized representatives prior to procedure and data collection.

Conflicts of Interest: The authors declare that they have no competing financial or non-financial interests.

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Data Availability Statement: The de-identified datasets analyzed during the current study are available from the corresponding author upon reasonable academic request.

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