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Original Research Article

Safety of Early Discharge After Primary Angioplasty

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Abstract: *Early discharge following primary percutaneous coronary intervention (PPCI) for ST-elevation myocardial infarction (STEMI) has gained attention due to its potential to optimize healthcare resources without compromising patient safety. While evidence from high-income countries supports this practice in carefully selected low-risk patients, data from low- and middle-income countries, including Pakistan, remain limited.* ***Objective:*** *To assess the safety and outcomes of early discharge (≤48 hours) compared with delayed discharge (>48 hours) after PPCI in STEMI patients.* ***Methods:*** *This prospective observational cohort study was conducted at Faisalabad Institute of Cardiology, Pakistan, from January to December 2024. A total of 100 consecutive STEMI patients undergoing successful PPCI were enrolled and stratified into two groups: early discharge (n = 50) and delayed discharge (n = 50). Discharge criteria included hemodynamic stability, absence of recurrent ischemia, stable rhythm, and adequate renal function. The primary outcome was all-cause mortality at 7, 30, 90, and 120 days. Secondary outcomes included unplanned readmission, reinfarction, stent thrombosis, stroke, repeat revascularization, major bleeding, and major adverse cardiac events (MACE). Statistical analyses included t-tests, chi-square tests, Fisher's exact tests, and logistic regression.* ***Results:*** *The mean age was 56.8 ± 10.4 years, with 74% males. Baseline demographics and risk factors were similar between groups. Mortality at 120 days was 4.0% in the early discharge group versus 6.0% in the delayed group (p=0.64). No significant differences were observed in readmission (4.0% vs. 6.0%, p=0.64), reinfarction (2.0% vs. 4.0%, p=0.56), stent thrombosis (0% vs. 2.0%, p=0.31), stroke (0% vs. 2.0%, p=0.31), repeat revascularization (2.0% vs. 4.0%, p=0.56), or major bleeding (2.0% vs. 4.0%, p=0.56). MACE occurred in 6.0% of early discharge and 12.0% of delayed discharge patients (p=0.29). Event-free survival at 120 days was 94.0% and 88.0%, respectively (p = 0.29).* ***Conclusion:*** *Early discharge (≤48 hours) after PPCI in selected low-risk STEMI patients demonstrated comparable mortality and adverse event rates to delayed discharge, supporting its safety in the Pakistani healthcare context. This strategy could improve hospital resource utilization without compromising patient outcomes.*

Keywords: ST-elevation myocardial infarction, primary percutaneous coronary intervention, early discharge, Pakistan, major adverse cardiac events, hospital stay

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Introduction

The management of ST-elevation myocardial infarction (STEMI) has undergone significant evolution over the past few decades, reflecting advancements in medical technology and treatment protocols, particularly in Primary Percutaneous Coronary Intervention (PPCI). Early discharge protocols following PPCI have garnered increasing attention due to their potential to enhance patient care and reduce healthcare costs. Recent guidelines from the European Society of Cardiology recommend that low-risk patients may be safely discharged within 48 to 72 hours after a successful PCI (1). This shift towards early discharge is motivated by the need to optimize resource allocation in healthcare facilities while ensuring patient safety.

The safety of early discharge after PPCI has been substantiated by various studies indicating that when performed on well-selected patients, such practices do not compromise clinical outcomes. Research suggests that advancements in vascular access technology and bioengineering of stents have contributed to fewer complications, thus supporting the feasibility of discharging patients earlier (2). For instance, a study by Sharkawi et al. highlighted that uncomplicated cases of STEMI managed with proper monitoring could be discharged safely as soon as 48 hours post-procedure, leading to reduced hospitalization costs and improved efficiency in healthcare services (3). Furthermore, the use of risk stratification scores, such as the Zwolle risk score, has been recommended to ensure safe early discharge by identifying low-risk patients who are likely to avoid prolonged hospitalization after PPCI (4).

This early discharge strategy, however, needs to be grounded in thorough patient assessment and follow-up protocols. Marbach et al. emphasized that implementing a robust discharge protocol can enhance patient safety while addressing logistical pressures in healthcare systems (5). Moreover, studies have indicated that many patients prefer early discharge and report high satisfaction with the postoperative care they receive (6). Importantly, effective cardiac rehabilitation and continuous monitoring can help mitigate potential risks associated with early discharge (7).

In the context of Pakistan, where healthcare infrastructure often faces significant challenges, the implementation of these evidence-based early discharge protocols presents a unique opportunity to enhance care delivery for STEMI patients. With the rising incidence of coronary artery diseases in the region, adopting a risk-based early discharge protocol could significantly relieve the burdens on healthcare systems while ensuring that limited resources are utilized more effectively (8). Furthermore, given the cultural context where family support and community health initiatives can be pivotal, the adoption of such protocols may encourage better patient compliance and follow-up care.

While there is substantial evidence supporting the benefits of early discharge post-PPCI, it is crucial to tailor these practices to fit the specific needs and constraints of the population served. In Pakistan, where the prevalence of cardiac conditions is significant, adopting an early

discharge strategy for eligible patients could not only alleviate hospital congestion but also enhance overall patient satisfaction and outcomes.

Methodology

This prospective observational cohort study was conducted at the Faisalabad Institute of Cardiology, Pakistan, from January 2024 to December 2024. The study enrolled a total of 100 consecutive patients who presented with acute ST-elevation myocardial infarction (STEMI) and underwent successful primary percutaneous coronary intervention (PCI) as the standard of care. Patients were included if they were aged 18 years or older and presented within twelve hours of symptom onset. They achieved restoration of normal coronary flow (TIMI grade 3) following angioplasty and stent deployment. Exclusion criteria comprised cardiogenic shock at presentation, severe left ventricular dysfunction with an ejection fraction less than 30%, presence of significant arrhythmias requiring prolonged monitoring, ongoing bleeding or contraindication to dual antiplatelet therapy, and those unable to provide informed consent or follow-up information.

After stabilization and successful angioplasty, patients were stratified into two groups based on their hospital stay duration: the early discharge group, which was discharged within 48 hours of the index procedure, and the delayed discharge group, which was discharged after 48 hours. Discharge decisions were at the discretion of the treating physician but followed predefined safety criteria, including hemodynamic stability, absence of recurrent ischemic symptoms, stable cardiac rhythm, and satisfactory renal function. All patients were prescribed guideline-directed medical therapy comprising dual antiplatelet therapy, high-intensity statins, beta-blockers, and ACE inhibitors or ARBs, unless contraindicated.

The primary outcome of interest was all-cause mortality at 7, 30, 90, and 120 days post-discharge. Secondary outcomes included unplanned hospital readmission, reinfarction, definite stent thrombosis, ischemic stroke, repeat revascularization, major bleeding (defined as Bleeding Academic Research Consortium [BARC] type 2 or higher), and the composite of major adverse cardiac events (MACE). Follow-up was performed through a combination of outpatient clinic visits and structured telephonic interviews at the specified time intervals. All outcome events were adjudicated by two independent cardiologists who were blinded to the discharge status.

Data were collected on pre-specified case report forms, which included demographic information, cardiovascular risk factors, infarct location, angiographic findings, and in-hospital clinical course. Continuous variables were expressed as mean ± standard deviation and compared between groups using Student's t-test. Categorical variables were presented as frequencies and percentages, with comparisons performed using the chi-square or Fisher's exact test, as appropriate. Cumulative event rates were analyzed at successive time intervals, and logistic regression analysis was performed to identify independent predictors of adverse outcomes at 120 days. A p-value of less than 0.05 was considered statistically significant. Statistical analysis was conducted using SPSS version 25.0 (IBM Corp., Armonk, NY, USA).

Ethical approval was obtained from the Institutional Review Board of the Faisalabad Institute of Cardiology prior to the initiation of the study. Written informed consent was obtained from all participants prior to enrollment, and the study was conducted in accordance with the principles outlined in the Declaration of Helsinki for biomedical research.

Results

A total of 100 patients were analyzed, comprising 50 in the early discharge group (≤48 hours) and 50 in the delayed discharge group (>48 hours). The mean age was 56.8 ± 10.4 years, with 74% males and 26% females. Baseline clinical characteristics, including hypertension, diabetes, smoking status, and infarct location, were similar between the two groups (Table 1).

At day 7, mortality was 0% in the early discharge group and 2.0% in the delayed discharge group (p=0.31). By day 30, mortality rates were equal at 2.0% in both groups (p = 1.00). At day 90, mortality remained low with 2.0% in the early discharge group versus 4.0% in the delayed discharge group (p=0.56). At day 120, cumulative mortality was 4.0% in early discharge compared to 6.0% in delayed discharge (p=0.64). No statistically significant difference was observed at any interval. (Table 2).

Unplanned readmission occurred in 4.0% of early discharge patients and 6.0% of delayed discharge patients (p=0.64). Reinfarction was recorded in 2.0% vs. 4.0% (p=0.56), while definite stent thrombosis occurred in 0% vs. 2.0% (p=0.31). Stroke was rare, with 0% in early discharge and 2.0% in delayed discharge (p = 0.31). Repeat revascularization was required in 2.0% vs. 4.0% (p=0.56), and major bleeding events were reported in 2.0% vs. 4.0% (p=0.56). Composite MACE was slightly higher in the delayed discharge group (12.0%) compared with early discharge (6.0%), though the difference was not statistically significant (p=0.29). (Table 3).

Cumulative mortality at 120 days was 4.0% in early discharge patients and 6.0% in delayed discharge patients (p=0.64). MACE was observed in 6.0% of the early discharge group and 12.0% of the delayed discharge group (p=0.29). Event-free survival was slightly higher in the early discharge group (94.0%) compared with the delayed discharge group (88.0%), although the difference was not statistically significant (p=0.29). (Table 4).

No statistically significant difference in all-cause mortality between early and delayed discharge groups at day 7, 30, 90, or 120. Rates of unplanned readmission, reinfarction, stent thrombosis, bleeding, and repeat revascularization were numerically lower in the early discharge group; however, these differences did not reach statistical significance. Event-free survival at 120 days was 94% in early discharge vs. 88% in delayed discharge (p=0.29).

Table 1. Baseline Demographic and Clinical Characteristics (n=100)

Variable	Early Discharge ≤48h (n=50)	Delayed Discharge >48h (n=50)	p-value
Age (years), mean ± SD	55.9 ± 9.8	57.6 ± 11.2	0.48
Male sex, n (%)	37 (74)	37 (74)	1.00
Hypertension, n (%)	29 (58)	33 (66)	0.41
Diabetes mellitus, n (%)	17 (34)	21 (42)	0.41
Smoking, n (%)	21 (42)	20 (40)	0.84
Anterior wall MI, n (%)	26 (52)	27 (54)	0.84
Multivessel disease, n (%)	16 (32)	20 (40)	0.39

Table 2. All-Cause Mortality at Follow-Up (Primary Outcome)

Follow-up Interval	Early Discharge ≤48h (n=50)	Delayed Discharge >48h (n=50)	p-value
Day 7	0 (0%)	1 (2.0%)	0.31
Day 30	1 (2.0%)	1 (2.0%)	1.00
Day 90	1 (2.0%)	2 (4.0%)	0.56

Day 120	2 (4.0%)	3 (6.0%)	0.64

Table 3. Secondary Outcomes up to 120 Days

Secondary Outcome	Early Discharge ≤48h (n=50)	Delayed Discharge >48h (n=50)	p-value
Unplanned readmission, n (%)	2 (4.0)	3 (6.0)	0.64
Reinfarction, n (%)	1 (2.0)	2 (4.0)	0.56
Definite stent thrombosis, n (%)	0 (0)	1 (2.0)	0.31
Stroke, n (%)	0 (0)	1 (2.0)	0.31
Repeat revascularization, n (%)	1 (2.0)	2 (4.0)	0.56
Major bleeding (BARC ≥2), n (%)	1 (2.0)	2 (4.0)	0.56
Composite MACE*, n (%)	3 (6.0)	6 (12.0)	0.29

**MACE = Major Adverse Cardiac Events (death, reinfarction, stent thrombosis, or stroke).*

Table 4. Cumulative Mortality and MACE at 120 Days

Outcome	Early Discharge ≤48h (n=50)	Delayed Discharge >48h (n=50)	p-value
Mortality	2 (4.0%)	3 (6.0%)	0.64
MACE	3 (6.0%)	6 (12.0%)	0.29
Event-free survival	47 (94.0%)	44 (88.0%)	0.29

Discussion

In evaluating the safety and efficacy of early discharge practices after primary angioplasty for ST-elevation myocardial infarction (STEMI), our study presents a comparative analysis between two groups: those discharged within 48 hours and those with delayed discharge beyond this period. The findings indicate comparable outcomes between the two groups in terms of mortality and unplanned readmissions across multiple follow-up intervals. This is consistent with recent literature suggesting that early discharge can be safely implemented in low-risk patients after percutaneous coronary intervention (PPCI) without compromising clinical outcomes.

The baseline demographic characteristics of our cohort revealed no significant differences in patient demographics or clinical profiles between the two groups, with both groups sharing a similar prevalence of risk factors such as hypertension, diabetes, and smoking. This aligns with findings from Gong et al. (9), who noted that early discharge strategies were particularly effective in low-risk populations. However, the literature also suggests careful risk stratification is necessary when considering early discharge protocols (10).

At various follow-up periods extending up to 120 days, mortality rates showed no significant differences between the early discharge and delayed discharge groups. Our findings of 2% mortality by day 30 in both groups are consistent with the meta-analysis by Marbach et al. (11), which supports early discharge protocols and indicates no increased mortality risk among patients discharged within 48 to 72 hours. Additionally, our cumulative mortality rates at 120 days are comparable to findings from Piris et al. (10), who observed similar mortality figures post-discharge in low-risk STEMI patients. This collective evidence suggests that early discharge does not adversely impact survival when patients are carefully selected for it.

Regarding unplanned readmissions and MACE, our results indicated that both outcome rates were slightly lower in the early discharge group, but did not achieve statistical significance. These findings support the conclusions drawn by Wu et al. (12), who noted low rates of recurrent adverse events in patients discharged early, provided careful monitoring and follow-up care were employed. The incidence of severe complications, such as stent thrombosis, reinfarction, and stroke, was also low, consistent with the results of studies that have highlighted the safety of contemporary PCI techniques in facilitating early discharge without increasing the risk of severe complications (13, 14).

The composite MACE rate was 6% in the early discharge group compared to 12% in the delayed discharge group, though this difference did not reach statistical significance. This contrasts with findings from some studies indicating concerns surrounding MACE in early discharge cohorts (15), yet supports findings from the EDAP-PCI trial, which reported no adverse MACE rates among patients undergoing early discharge (9). Additionally, the event-free survival rate of 94% in the early discharge group compared to 88% in the delayed discharge group indicates an overall favorable outcome from early discharge protocols. However, the difference was not statistically significant. Such results suggest that operationalizing early discharge protocols can be judicious, particularly when hospitals face resource constraints (16).

Our findings suggest that early discharge following successful PPCI can be safely performed for low-risk STEMI patients, as reflected in our comparable mortality and morbidity rates to the delayed discharge group. In the Pakistani context, where the burden of cardiovascular disease is substantial and healthcare resources are often strained, implementing early discharge protocols could lead to improved patient turnover and health system efficiency while maintaining patient safety (14). Future studies should focus on refining patient selection criteria and exploring the integration of follow-up interventions, as continuing care is pivotal in ensuring favorable outcomes after discharge. The cultural acceptance and support structures for patients returning home after a procedure also highlight the importance of involving family and community resources in reinforcing compliance with medical advice and rehabilitation practices.

Conclusion

In this study, early discharge within 48 hours after PPCI in low-risk STEMI patients was as safe as delayed discharge, with no significant differences in mortality, readmissions, or major adverse cardiac events at 120 days. Implementing risk-based early discharge protocols in Pakistan could enhance healthcare efficiency while maintaining patient safety.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBECMMNCS-0331d-24)

Consent for publication

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Conflict of interest

The authors declared the absence of a conflict of interest.

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All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

References

1. Piris A., Garcia-Linacero L., Ortega-Perez R., Rivas-Garcia S., Martinez-Moya R., Sanmartín M.et al. Safety of an early discharge strategy (≤48 h) after ST-elevation myocardial infarction. Journal of Clinical Medicine 2024; 13(13):3827. https://doi.org/10.3390/jcm13133827
2. Li S., Li Z., Hou X., Sun J., Kang L., Cheng Y.et al.. Safety and cost analysis of early discharge following percutaneous coronary intervention for acute coronary syndrome in patients with diabetes mellitus. Journal of International Medical Research 2019; 47(8):3905-3917. https://doi.org/10.1177/0300060519842777
3. Sharkawi M., McMahon S., Jabri D., & Thompson P... Current perspectives on location of monitoring and length of stay following PCI for ST elevation myocardial infarction. European Heart Journal Acute Cardiovascular Care 2019; 8(6):562-570. https://doi.org/10.1177/2048872619860217
4. Banga S., Gumm D., Kizhakekuttu T., Emani V., Singh S., Singh S.et al.. Left ventricular ejection fraction along with Zwolle risk score for risk stratification to enhance safe and early discharge in STEMI patients undergoing primary percutaneous coronary intervention: a retrospective observational study. Cureus 2019. https://doi.org/10.7759/cureus.5272
5. Marbach J., Alhassani S., Chong A., MacPhee E., & May M.. A Novel Protocol for Very Early Hospital Discharge After STEMI Canadian Journal of Cardiology 2020;36(11):1826-1829. https://doi.org/10.1016/j.cjca.2020.08.012
6. Shibata N., Ito T., Morita Y., Toyoda H., Kanzaki Y., Watanabe N.et al. Impact of the fibrosis-4 index in patients with ST-elevated myocardial infarction. Coronary Artery Disease 2024; 36(2):99-107. https://doi.org/10.1097/mca.0000000000001431
7. Shah Z., Jamal Q., Ullah N., Ahmad T., & Ahmed M... Effectiveness of cardiac rehabilitation in myocardial infarction patients after percutaneous coronary intervention. Cureus 2022. https://doi.org/10.7759/cureus.26684
8. Mujtaba S., Khan M., Sohail H., Sial J., Karim M., Saghir T.et al.. Outcome at six months after primary percutaneous coronary interventions performed at a rural satellite center of Sindh province of Pakistan. Cureus 2020. https://doi.org/10.7759/cureus.8345
9. Gong W., Li A., Ai H., Shi H., Wang X., & Nie S.. Safety of early discharge after primary angioplasty in low-risk patients with ST-segment elevation myocardial infarction: a meta-analysis of randomised controlled trials. European Journal of Preventive Cardiology 2018; 25(8):807-815. https://doi.org/10.1177/2047487318763823
10. Piris A., Garcia-Linacero L., Ortega-Perez R., Rivas-Garcia S., Martinez-Moya R., Sanmartín M.et al. Safety of an early discharge strategy (≤48 h) after ST-elevation myocardial infarction. Journal of Clinical Medicine 2024; 13(13):3827. https://doi.org/10.3390/jcm13133827
11. Marbach J., Alhassani S., Chong A., MacPhee E., & May M.. A Novel Protocol for Very Early Hospital Discharge After STEMI Canadian Journal of Cardiology 2020; 36(11):1826-1829. https://doi.org/10.1016/j.cjca.2020.08.012
12. Wu Q., Zhang D., Zhao Q., Liu L., He Z., Chen Y., et al.. Effects of transitional health management on adherence and prognosis in elderly patients with acute myocardial infarction in percutaneous coronary intervention: a cluster randomized controlled trial. Plos One 2019; 14(5):e0217535. https://doi.org/10.1371/journal.pone.0217535
13. Scarsini R., Kotronias R., Mora F., Portolan L., Andreaggi S., Benenati S.et al. Angiography-derived index of microcirculatory resistance to define the risk of early discharge in STEMI. Circulation Cardiovascular Interventions 2024; 17(3). https://doi.org/10.1161/circinterventions.123.013556
14. Lv J., Wang C., Gao X., Yang J., Zhang X., Ye Y.et al... Development and validation of dynamic models to predict postdischarge mortality risk in patients with acute myocardial infarction: results from China Acute Myocardial Infarction Registry. BMJ Open 2023;13(3):e069505. https://doi.org/10.1136/bmjopen-2022-069505
15. Hydzik P., Kolarczyk E., Kustrzycki W., Kubielas G., Kałużna–Oleksy M., Szczepanowski R.et al.. Readiness for discharge from hospital after myocardial infarction: a cross-sectional study. International Journal of Environmental Research and Public Health 2021;18(13):6937. https://doi.org/10.3390/ijerph18136937
16. Gowani A., Dhakam S., Noor A., Iftikhar I., Ahmed F., & Tufail M. Randomized controlled trial to evaluate the safety of same-day discharge after percutaneous coronary intervention (PCI). 2021. https://doi.org/10.21203/rs.3.rs-58169/v1.