Journal of Population Therapeutics & Clinical Pharmacology

CLINICAL AUDIT
DOI: 10.53555/q84d5z54

CLINICAL AUDIT ON RECORDING DOOR-TO-BALLOON TIME IN A TERTIARY CARE HOSPITAL FOR STEMI PATIENTS

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Introduction

ST-Elevation Myocardial Infarction (STEMI) is one of the most critical forms of acute coronary syndrome (ACS) and occurs due to complete thrombotic occlusion of a coronary artery, leading to irreversible myocardial necrosis if not treated promptly. It accounts for a large proportion of cardiovascular morbidity and mortality worldwide, particularly in developing regions like South Asia, where access to timely and advanced cardiac care may be limited (1,2).

Reperfusion therapy is the cornerstone of STEMI management, with Primary Percutaneous Coronary Intervention (PCI) being the preferred method when available and performed in a timely fashion. Compared to fibrinolytic therapy, PCI has shown superior outcomes in terms of achieving coronary artery patency, reducing infarct size, preserving left ventricular function, lowering reinfarction rates, and improving long-term survival (3,4).

A crucial performance indicator in the management of STEMI is the Door-to-Balloon (D2B) time, defined as the interval from a patient's arrival at the emergency department (ED) to the inflation of the angioplasty balloon in the catheterization laboratory. Clinical guidelines, including those from the American College of Cardiology (ACC) and the American Heart Association (AHA), recommend a D2B time of 90 minutes or less in at least 90% of patients to optimize outcomes (5). Evidence suggests that each 30-minute delay in reperfusion increases the relative risk of mortality by 7.5% (6).

However, in low-resource settings like Baluchistan, multiple systemic barriers—such as delayed presentation, inefficient triage, limited Cath lab availability, and underdeveloped emergency services—contribute to prolonged D2B times. These delays not only compromise patient outcomes but also negate the benefits of PCI, especially when D2B exceeds 120 minutes, where thrombolysis may offer equal or better results (7,8).

This clinical audit aims to assess the current practices regarding the documentation and timeliness of

D2B time in a tertiary care setting in Quetta. By identifying bottlenecks and areas of improvement, the audit seeks to support evidence-based changes in clinical workflow to enhance STEMI outcomes in the region.

Materials and Methodology

This prospective clinical audit was conducted over a four-month period, from 1st September 2024 to 31st December 2024, at Sheikh Mohamed Bin Zayed Al Nahyan Institute of Cardiology (SMBZAN ICQ), a tertiary care cardiac hospital located in Quetta, Baluchistan. The audit aimed to assess adherence to American Heart Association (AHA) guidelines regarding Door-to-Balloon (D2B) time in patients presenting with ST-Elevation Myocardial Infarction (STEMI), with the objective of evaluating the efficiency of the hospital's acute myocardial infarction response protocols.

The audit included adult patients aged 18 years and older who were diagnosed with STEMI based on clinical symptoms and 12-lead ECG findings and who underwent primary percutaneous coronary intervention (PCI) during the study period. Only those patients who presented directly to the hospital's emergency department were included, while inter-hospital transfers, out-of-hospital cardiac arrests, and cases with incomplete documentation of D2B time were excluded. Patients who underwent fibrinolysis or received non-PCI treatment, and those with contraindications to PCI, were also excluded.

Data were collected prospectively using a structured proforma by reviewing emergency department records, catheterization lab logs, and patient medical files. The main time intervals recorded were the 'door time' (time of arrival in the ED) and the 'balloon time' (time of first balloon inflation in the Cath lab), and the D2B time was calculated as the difference between the two. Additional data, such as patient demographics, time of presentation (working vs. off- hours), time to ECG, time for Cath lab activation, and reasons for delay (if applicable), were also noted.

Descriptive statistics were used to calculate the mean, median, and range of D2B times. The proportion of patients achieving the recommended D2B time of 90 minutes or less was calculated, and cases exceeding this target were further evaluated for contributing factors. Data analysis was performed using Microsoft Excel, and relevant associations were examined.

Ethical approval was obtained from the Institutional Ethics Committee of SMBZAN ICQ. As this was a prospective audit involving human participants, informed consent was taken from all patients. Confidentiality and anonymity of patient data were strictly maintained throughout the study process.

Results

During this time (01 September 2024 to 31 December 2024), we looked at 110 patients who had primary PCI. Most of them were cured quite fast. The average time from door to balloon was roughly 62 minutes, and for half of the patients, it was less than 58 minutes, which is quite comforting. The most common time we saw was about 52 minutes, which shows that our staff usually gets patients to the cath lab well within the suggested time frame.

The fastest time ever recorded was only 35 minutes, which shows how well our processes can function when everything goes right. The largest delay, on the other hand, lasted 12 hours, largely due of problems getting consent and certain logistical problems that couldn't be avoided, especially during off-hours.

We found that roughly 89% of patients were treated within the 90 minutes that the guidelines said they should be, which is a very good result. Still, about 1 in 10 patients had to wait, which reminds us that we can always improve our processes and aspire even higher. These details are summarized in **Table 1**, which provides a concise overview of key audit metrics, including the mean, median, and mode times.

Table: Summary of Door-to-Balloon Times

Parameter	Value
Total patients audited	110
Mean D2B time	62 ± 34 minutes
Median D2B time	58 minutes
Mode D2B time	52 minutes
Shortest D2B time	35 minutes
Longest D2B time	12 hours (720 minutes)
Patients ≤90 min (compliant)	98 (89%)
Patients >90 min (delayed)	12 (11%)

*D2B: Door-to-balloon time

Discussion

In this audit, we found that **88% of STEMI patients** achieved a **Door-to-Balloon (D2B) time of ≤90 minutes**, meeting the American College of Cardiology (ACC) and American Heart Association (AHA) recommended benchmark for timely reperfusion. This is a promising indicator of efficient acute cardiac care delivery at our centre and reflects positively on the institution's emergency response protocols and Cath lab readiness.

These results contrast with earlier studies from low-resource settings, where systemic inefficiencies often lead to significant delays in initiating primary PCI. For example, a 2023 study from Quetta reported that nearly one-third of STEMI patients experienced D2B times exceeding 120 minutes, contributing to suboptimal outcomes and increased mortality (10). Compared to these findings, our results demonstrate substantial progress and reflect the benefit of streamlined triage, rapid ECG acquisition, timely Cath lab activation, and focused protocol adherence.

However, it is important to highlight that **11% of patients** still experienced D2B times exceeding the 90-minute threshold. In Baluchistan, a province in southwestern Pakistan, the burden of cardiovascular diseases, including STEMI, is growing. Despite this, the infrastructure for timely intervention remains a challenge due to geographic barriers, limited healthcare facilities, and lack of specialized cardiology services in rural areas. This is compounded by delays in patient presentation and prolonged D2B times, which are significant predictors of poor outcomes in STEMI patients [10]. Recent local studies suggest a rising prevalence of STEMI in Baluchistan, highlighting the need for efficient management protocols to reduce D2B time and improve patient prognosis. According to a study conducted in Quetta, the capital of Baluchistan, approximately 20-30% of patients presenting with acute myocardial infarction (MI) are diagnosed with STEMI, and the region's D2B time frequently exceeds the recommended target, contributing to suboptimal outcomes [9,11,12].

In the context of Baluchistan—a region with growing ischemic heart disease burden but limited interventional cardiology facilities—our findings emphasize both the progress made and the areas needing further refinement. While our centre is among the few in the province offering primary PCI around the clock, the regional healthcare infrastructure still lacks widespread access to advanced cardiac care. Therefore, efforts should now focus on **systematic improvements**, including real-time D2B monitoring dashboards, continuous staff training, public education for early symptom recognition, and further investment in emergency cardiovascular infrastructure.

In summary, while the audit results show encouraging adherence to international standards, particularly in a resource-limited setting, there remains scope to reduce residual delays and improve equity in timely STEMI management across the region.

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