The Relationship Between Onset-To-Treatment Time Interval and History of PCI Therapy With Triage Selection in The Cardiac Emergency Center For STEMI Patients

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Abstract

STEMI remains the leading cause of cardiovascular mortality, demanding an integrated management system to save the myocardium, where the accuracy of triage decisions is the key determinant of timely access to cardiac catheterization. However, in practice, several clinical factors can complicate triage assessment, including variations in symptom presentation and specific patient characteristics. A prolonged onset-to-symptom interval often alters and obscures symptoms, while a history of prior Percutaneous Coronary Intervention (PCI) is not always clearly evident. This study employed an analytical observational design with a cross-sectional approach to analyze the correlation between independent and dependent variables. The study was conducted in the Cardiac Emergency Center (CEC) of Haji Adam Malik General Hospital during the period of September to December 2024. The study population consisted of all patients diagnosed with ST-Elevation Myocardial Infarction (STEMI). The sampling technique used was total sampling, yielding 86 respondents. Based on statistical testing, the correlation between STEMI onset time and triage category selection was found to be 0.003, indicating a significant correlation between the two variables. Meanwhile, the variable of PCI history with triage category selection had a significance value of 0.308, suggesting no correlation between the two variables. The onset-to-symptom interval is a factor significantly correlated with the selection of triage priority level in STEMI patients at the Cardiac Emergency Center. This reinforces the principle of *"time is muscle"* in STEMI management, where the duration from symptom onset to hospital arrival directly influences the assessment of severity and the determination of treatment priority by nurses.

INTRODUCTION

Acute ST-segment elevation myocardial infarction (STEMI) remains becoming the main cause of global cardiovascular mortality, imposing a significant economic burden on healthcare systems and necessitating an integrated and responsive care approach to preserve myocardial tissue (Herrera et al., 2025). The principle of "time is muscle" continues to serve as a fundamental cornerstone in STEMI management, where each minute of reperfusion delay is directly associated with increased mortality and long-term complications, such as heart failure (Dziewierz et al., 2025).

At the national level, cardiovascular disease case reports indicate that delayed presentation of STEMI patients to healthcare facilities remains a complex systemic challenge (Riyanti et al., 2023). Factors such as low public awareness of heart attack symptoms, limited transportation access, and geographic disparities contribute to prolonged total ischemic time from symptom onset to reperfusion (Wenger et al., 2022).

The Emergency Department (ED) serves as a critical point in the STEMI patient survival chain, where the accuracy of triage decisions is a key determinant of timely access to cardiac catheterization (Sax et al., 2025). An ideal triage process should be capable of identifying STEMI patients within 10 minutes of arrival and immediately assigning them to the highest priority category to minimize door-to-balloon time (Su et al., 2021). In some hospitals, cardiac emergencies are managed within a dedicated unit known as the Cardiac Emergency Center (CEC).

In practice, however, several clinical factors can complicate triage assessment, including variations in symptom presentation and patient-specific characteristics. Onset-to-symptom intervals exceeding 12 hours often shift the management strategy from primary reperfusion to conservative therapy, while history of PCI may obscure symptom interpretation (Damluji et al., 2023). According to STEMI management guidelines, patients should be considered for door-to-balloon interventions within a maximum of 90 minutes, regardless of onset-to-arrival time or PCI history. This underscores the need for triage nurses to recognize symptoms as early as possible and to assign appropriate triage priority to ensure prompt intervention.

Previous studies have not thoroughly examined the correlation between patients' symptom onset-to-arrival time and the triage process they receive. One study concluded that early delays related to STEMI symptom onset may influence triage assessment (Yiadom et al., 2022). Another study reported an association between the triage process (timing) and STEMI detection, although it did not consistently report a direct correlation between onset-to-arrival time and triage category selection (Gopinath et al., 2022). In Addition, no studies have investigated the correlation between therapeutic history and the selection of triage priority levels.

Based on this background, the present study aims to analyze the relationship between onset-to-arrival time and PCI therapy with triage priority selection in the emergency department among STEMI patients. The findings of this study are expected to identify factors influencing triage decision-making and contribute to the development of more specific assessment protocols for patient populations with complex characteristics. The implementation of protocols informed by this field study is ultimately anticipated to enhance the accuracy of triage classification, expedite therapeutic response times, and improve overall clinical outcomes for STEMI patients.

RESEARCH METHOD

This study employed an analytical observational design with a cross-sectional approach to examine the correlational relationship between independent and dependent variables. The study was conducted in the Cardiac Emergency Center (CEC) at RSUP Haji Adam Malik from September to December 2022. The study population comprised all patients diagnosed with ST-elevation myocardial infarction (STEMI). A total sampling technique was used, in which all patients meeting the inclusion criteria—namely, adult patients with a recent STEMI diagnosis and stable condition who were willing to provide informed consent—were included as study respondents.

Primary data were collected directly at the study site using a research instrument in the form of a structured questionnaire. The instrument consisted of three sections: demographic and clinical data, a section on independent variables (onset-to-arrival time and PCI history), and a section on the dependent variable (triage category selection). Data collection was conducted after obtaining ethical approval and informed consent from each participant.

The collected data were analyzed statistically using appropriate software. Univariable analysis was performed to describe the respondents' characteristics. Subsequently, bivariate analysis was conducted to examine the relationships between variables using the Spearman

Rank Correlation test, as the data were ordinal. Prior to implementation, the study protocol received ethical approval from the relevant Ethics Committee (approval number: 3774/UN10.F17.11.21/TA.00.04/2022), ensuring the principles of confidentiality, anonymity, and voluntary participation of all respondents.

RESULTS

From the data collection conducted between September and December, a total of 86 respondents were included, with the following demographic characteristics.

Table 1. Demographic Characteristics (N=86)

No	Characteristics		Distribution	Frequency
1	Gender	Male	72	83.7
		Female	14	16.3
2	Age	40-49	20	23.3
		50-59	37	43
		60-69	25	29.1
		>69	4	4.7
3	Profession	Housewife	11	12.8
		Retired Employe	9	10.5
		Self-Employed	19	22.1
		Civil Servant	12	14
		Farmer	25	29.1
		Unemployed	10	11.6
4	Smoking History	Smoking	45	52.3
		Not smoking	41	47.7
5	Diabates Mellitus History	With History of Diabetes Mellitus	26	30.2
		Without History of Diabetes Mellitus	60	69.8
6	Hypertension History	With History of Hypertension	36	30.2
		Without History of Hypertension	50	69.8

Based on the table above, 83.7% of the patients were male. The most common age group was 50–59 years, comprising 37 individuals (43%). The majority of patients were farmers (29.1%) and self-employed (22.1%). Additionally, 52.3% of patients had a history of smoking, 69.8% had a history of diabetes mellitus, and 69.8% were found not to have a history of hypertension.

Table 2. Distribution of Data

No	Variables		Distribution	Frequency
1	Onset	1-5 Hours	20	23.3
		6-10 Hours	27	31.4
		11-15Hours	13	15.1
		16-20 Hours	5	5.8

		>20 Hours	21	24.4
2	PCI History	with PCI history	12	14.0
		Without PCI History	74	86.0
3	Triage	Red	32	37.2
		Yellow	42	48.8
		Green	12	14

The statistical test used was the Spearman Rank Correlation. This approach was chosen because the data were not normally distributed. The test was conducted to measure the correlation between onset-to-arrival time and PCI history with triage selection in STEMI patients.

Table 3. Correlational Analysis

Independent Variabel	Dependent Variable	P value
Onset	Triage	0.003
PCI History	Triage	0.308

Based on the statistical analysis, a correlation was found between STEMI onset-to-arrival time and triage category selection, with a significance value of 0.003, which is less than 0.05. This indicates a statistically significant correlation between the two variables. In contrast, the correlation between PCI history and triage category selection yielded a significance value of 0.308, which is greater than 0.05, indicating no statistically significant correlation between these variables.

DISCUSSION

Statistical test result shows that there is correlation between onset-to-presentation time and the selection of triage categories among patients with ST-elevation myocardial infarction (STEMI). The analysis result shows that the longer onset-to-arrival intervals, then the higher percentage of patients' possibility to get lower or less priority. This finding is related with the principle of STEMI management which emphasize that "time is myocardium" (Damluji et al., 2023).

This phenomenon may occur because patients at the time of initial symptom onset may no longer clearly perceive these symptoms, which can become vague or less distinct. Some patients may ignore their initial symptoms, leading to delayed presentation to the hospital and further attenuation of symptom clarity. Atypical symptom presentation subsequently contributes to delays in in-hospital diagnosis, including delays in the assignment of appropriate triage priority (Sax et al., 2025). Each time delay from symptom onset to hospital arrival is directly proportional to greater myocardial damage and an increased risk of mortality, thereby directly influencing triage nurses' assessment of clinical severity (Alrawashdeh et al., 2021). In addition, accurate triage assessment relies heavily on clinical parameters. Patients with longer onset-to-arrival times may exhibit deceptively stable hemodynamic manifestations, despite a persistently high risk of complications such as ventricular fibrillation or cardiogenic shock (Ameri et al., 2021).

Other studies have shown that delays in seeking treatment among patients with ST-elevation myocardial infarction (STEMI) consist of three main phases: the time interval from symptom onset to the patient's decision to seek medical attention, the interval from the decision to seek medical attention to first medical contact (FMC), and the interval from FMC to hospital arrival. Among these phases, the decision-making time is typically the primary factor responsible for overall delays in STEMI evaluation (Jägeret al., 2017). Therefore, these

findings further emphasize the importance of public education in promoting early recognition of STEMI symptoms and prompt seeking of medical care.

On the other hand, statistical analysis also revealed that history of PCI therapy had no significant correlation with triage priority selection. Several factors may account for this finding. One possible explanation is the context of emergency severity assessment at the emergency department entrance, where triage nurses may place greater emphasis on the patient's current acute clinical symptoms (Gorick et al., 2023). It can therefore be inferred that the presenting clinical signs may not be directly related to, nor highlight, the patient's previous history of revascularization. Triage nurses primarily assess the patient's current condition when determining triage priority, rather than relying on past medical history or previous therapeutic interventions (Moura et al., 2022).

A patient with history of percutaneous coronary intervention (PCI) may experience a new infarction in a different coronary vessel or develop restenosis, both of which require the same level of urgent management as a first-time presentation (Jiao et al., 2025). Other studies have clearly stated that PCI treatment priority is determined by established protocols and presenting symptoms; therefore, a history of PCI is not considered a primary determining factor (Yang, 2025). It can be concluded that PCI history should not be automatically regarded as a factor that reduces the current level of clinical severity. Triage decisions appear to be more strongly based on the patient's physiological condition at presentation, such as chest pain, ST-segment elevation on electrocardiography, and vital signs, which serve as objective indicators of life-threatening conditions (Alrawashdeh et al., 2021).

Overall, the data collection and analysis conducted in this study highlight a primary focus on triage assessment in patients with ST-elevation myocardial infarction (STEMI). Onset-to-presentation time was shown to be a relevant associated factor, whereas certain medical histories, such as percutaneous coronary intervention (PCI), did not automatically influence treatment priority. The implications of these findings indicate the need to refine triage protocols that explicitly emphasize symptom onset duration as a key criterion, without diminishing vigilance toward patients with a history of ischemic heart disease. Continuous training for triage nurses is essential to reassess and integrate all available clinical information, including PCI history. Furthermore, more detailed monitoring of patients' medical history and therapeutic background is required to ensure accurate triage priority determination.

CONCLUSION

Onset-to-arrival time is a factor which significantly correlated with the selection of triage priority levels among patients with ST-elevation myocardial infarction (STEMI) in the Cardiac Emergency Center. This finding emphasizes the principle of "time is muscle" in STEMI management where the duration from symptom onset to hospital arrival directly influences the assessment of clinical urgency and the determination of treatment priority by nurses. In contrast, the previous history of percutaneous coronary intervention (PCI) was found to have no significant correlation with triage priority selection. This finding indicates that during rapid and objective triage processes, nurses focus more on the patient's acute clinical presentation rather than revascularization history. A history of PCI is not considered as determinant to downgrade or upgrade triage priority levels. The context of STEMI triage, time parameter (symptom onset) has more influences than history of coronary intervention. The implications of these findings emphasize the need for triage protocols that consistently prioritiz e symptom duration as one of main components of assessment, while still comprehensively considering the patient's overall clinical condition.

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