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A study to reduce door-to-balloon time in STEMI via ER nurse driven protocol

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Abstract
Background: Cardiovascular Diseases (CVDs) are the leading causes of death. Prompt reperfusion access is essential for patients who have Myocardial Infarction (MI) with ST-segment elevation as they are at a relatively high risk of death. Primary Percutaneous Coronary Intervention (PCI), using a catheter with an inflatable balloon, aims to restore blood flow by reopening blocked arteries reducing door-to-balloon (D2B) time for ST-Segment Elevation Myocardial Infarction (STEMI) has been shown to improve outcomes. Delays still occur due to various factors such as time to laboratory activation and diagnostic clarification in equivocal cases. We propose that early communication through early communication between emergency medical services (EMS) and in-hospital providers can reduce EMS-to-balloon time and provide coordinated care to impact D2B time.
Methods: Focus groups Involved all the patients who were had a symptoms of STEMI, NSTEMI and diagnosed, than underwent cath lab procedures.
Results: The study revealed that the improved door to balloon time which was more than 90 minutes is reduced to less than 90 minutes. Standing orders for ER was very helpful to reduce the door to balloon time. Educating and proper counselling was done on ER patients who all are came with the complaints of chest pain or suspected for STEMI.
Conclusion: Shortening D2B time was significantly associated with survival benefit, and the survival benefit of shortening D2B time was consistently observed, even <60 to 90 minutes. Mortality and non-fatal complications did not differ significantly between STEMI patients before and after a quality improvement intervention. However, the number of patients treated within 55 min from arrival was significantly higher after the intervention; and coronary intervention within this time was associated with a lower death rate.

Keywords: Cardiovascular diseases, Stemi, door-to-balloon time, percutaneous coronary intervention, emergency medical services

Introduction

Coronary Artery Disease (CAD) is one of the leading causes of death globally. Cardiovascular Diseases (CVDs) have now become the leading cause of mortality in India. A quarter of all mortality is attributable to CVD. Ischemic heart disease and stroke are the predominant causes and are responsible for > 80% of CVD deaths. Door to balloon time is an important cardiovascular process measure because it is both clinically meaningful and actionable. On a patient level, door-to-balloon time directly correlates with an amount of time the myocardium undergoes ischemic damage. Intuitively, reducing such time should reduce the degree of ischemic damage and ultimately improve patient outcomes.

In patients with ST-segment-elevation myocardial infarction, timely reperfusion therapy with door-to-balloon (D2B) time < 90 minutes is recommended by the current guidelines. However, whether further shortening of symptom onset-to-door (O2D) time or D2B time would enhance survival of patients with ST-segment-elevation myocardial infarction remains unclear. Therefore, the current study aimed to evaluate the prognostic impact of O2D or D2B time in patients with ST-segment-elevation myocardial infarction who underwent primary percutaneous coronary intervention.

Need for the study

The purpose of this study was to demonstrate the feasibility of routine transfer of ST-segment elevation myocardial infarction (STEMI) patients to achieve Percutaneous Coronary Intervention (PCI) in less than 90 min from presentation.

Objectives

1. To utilize a nurse-driven protocol to reduce Door to-Reperfusion time in STEMI, NSTEMI patients to align with ACC/AHA guidelines.
2. To improve STEMI and NSTEMI patient outcomes by reducing the time between ER admission and cath lab transfer in HCG Suchirayu Hospital, Hubli.
3. To evaluate the ER contributing factor towards Door-to-Balloon Reperfusion delay.

Hypotheses

Materials and Methods

- **Research approach:** Evaluative quantitative approach
- **Research design:** Interventional Design
- **Setting:** The study was conducted at ER and CATH LAB at Suchirayu hospital Hubli.
- **Population:** All patients arrived to ER with symptoms of STEMI, NSTEMI and diagnosed, than underwent cath lab procedures.
- **Sample and sample size:** All STEMI and NSTEMI patients under went Cath lab procedure, 30
- **Sampling technique:** Purposive sampling technique.
- **Tools/Instruments used in the study:** Structured observation checklist.
- **Method of data collection:** Focus groups Involved all the patients who were had a symptoms of STEMI, NSTEMI and diagnosed, than underwent cath lab procedures.
- **Plan for data analysis and interpretation:** Observation check list used for data analysis and interpretation.

Sampling Criteria

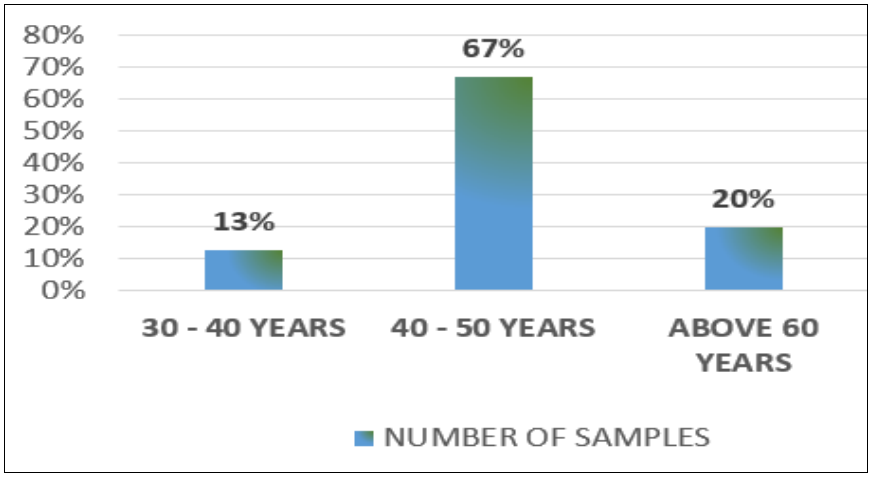
Inclusive criteria

The study was conducted over a period of 3 month, extending from July 2023 to September 2023, in an ER and Cath lab unit suchirayu hospital Hubli. A total of 30 patients who were diagnosed STEMI, NSTEMI, angina, and unstable Angina were selected.

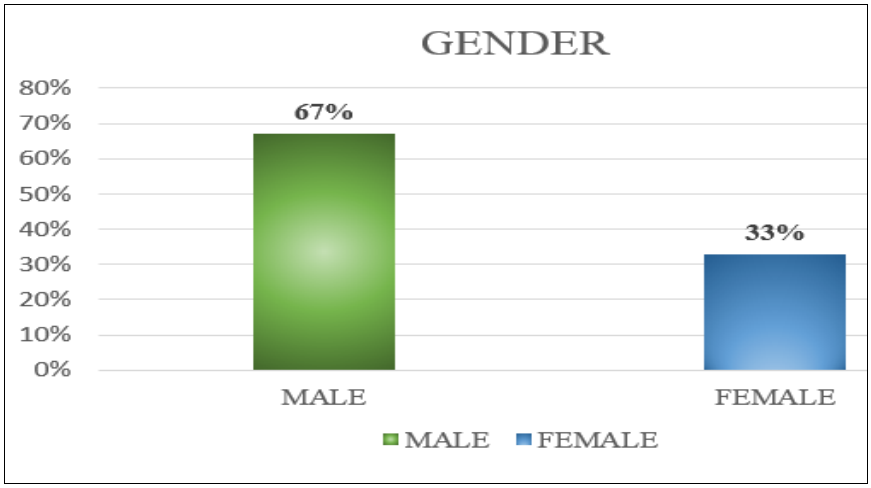
Exclusive Criteria

- All the patient who all having sr. creatine more than 2.0mg/dl,
- Ppatient who had any blockage of femoral or radial artery.
- Patent who had sudden cardiac arrest in ER.

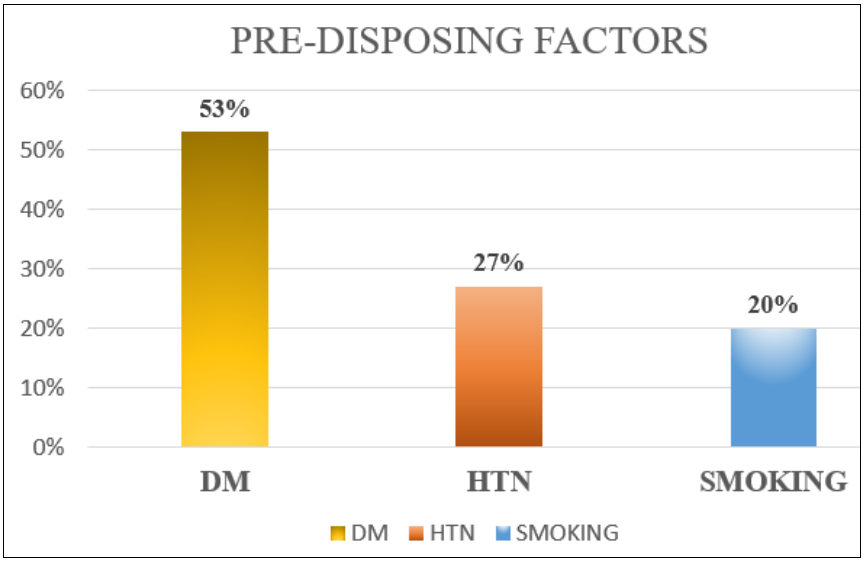
Demographic Variables



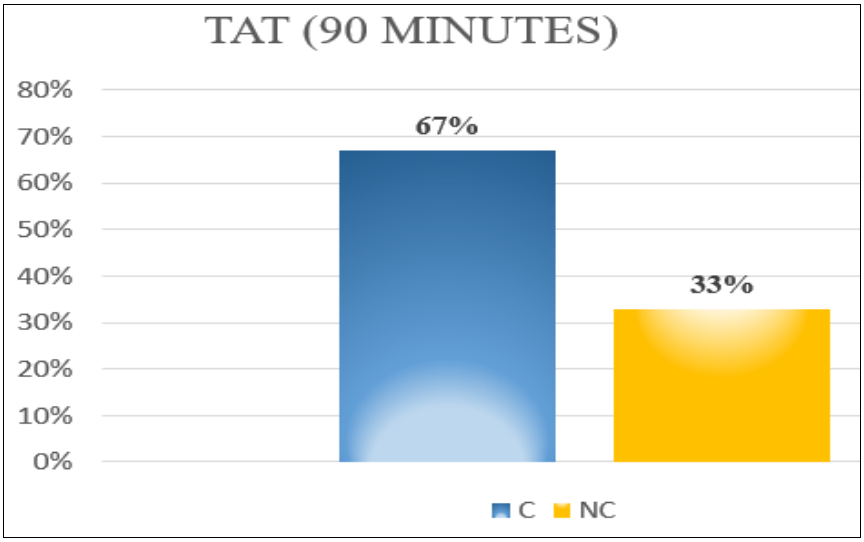
age	Number of samples (in %)
30-40 Years	13%
40-50 Years	67%
Above 60 Years	20%



Gender	Number of samples (In %)
Male	67%
Female	33%



Pre-Disposing Factors	Number of Samples (In %)
DM	53%
HTN	27%
Smoking	20%



Parameter	C	NC
TAT (90 Minutes)	67%	33%

Audit Data findings

Delay in sending all the investigations for the STEMI and NSTEMI patients because of non-availability of consultant and seeking their order for the particular patients.

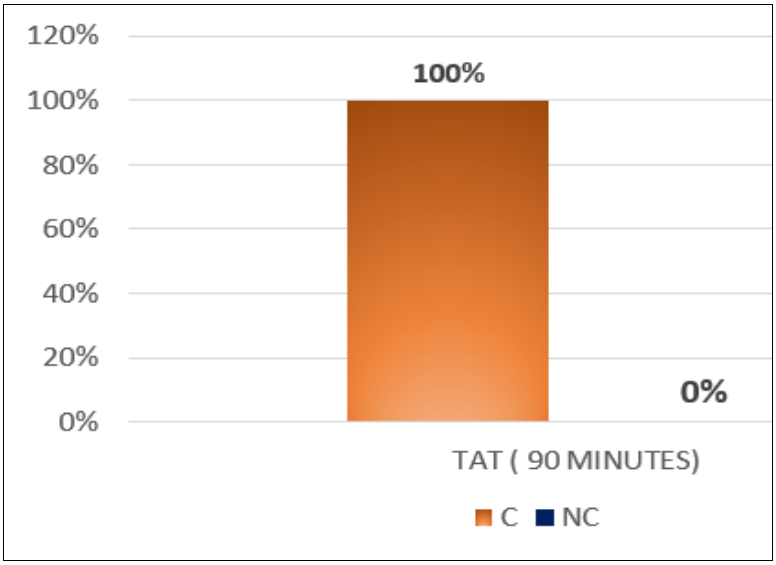
Delay due to consent

- Delay due to lack of awareness about the time importance in STEMI and NSTEMI patients among ER staff nurses.
- Delay in diagnosis of the patient and following the required investigation for the Cath lab procedures.

Implementations

- Efforts should continue to decrease the door-to-balloon time for all patients with STEMI undergoing primary PCI. Degree of urgency should not depend on time of symptom onset or baseline risk factors.
- ER standing order for investigation and treatment is been placed for all the STEMI and NSTEMI patients to reduce the door to balloon time less than 90 mint.
- CNE and OJT's are conducted for all the ER and CATHLAB nursing staff on importance of Door to Balloon time in the patients with STEMI and NSTEMI.

Post Audit Data Findings



Parameters	C	NC
TAT (90 Minutes)	100%	0%

Post Audit Data Findings

- Post audit data revealed that the improved door to balloon time which was more than 90 minutes is reduced to less than 90 minutes.
- Standing orders for ER was very helpful to reduce the door to balloon time.
- Educating and proper counselling was done on ER patients who all are came with the complaints of chest pain or suspected for STEMI.

Discussion

From a systems point of view, door-to-balloon time is an actionable measure. It has a clearly defined start point and end point, making it a specific and measurable target for improvement. In contrast to demographic and clinical characteristics known to affect patient outcomes, door-to-balloon time is a risk factor that is clearly modifiable by healthcare providers.

In patients with STEMI, shortening D2B time was significantly associated with reduced 1-year mortality. The survival benefit of shortening D2B time was consistently observed, even < 60 minutes. An "as soon as possible" strategy to minimize in-hospital delay may improve outcome of patients with STEMI.

Conclusion

Shortening D2B time was significantly associated with survival benefit, and the survival benefit of shortening D2B time was consistently observed, even <60 to 90 minutes. Mortality and non-fatal complications did not differ significantly between STEMI patients before and after a quality improvement intervention. However, the number of patients treated within 55 min from arrival was significantly higher after the intervention; and coronary intervention within this time was associated with a lower death rate.

Conflict of Interest: Not available

Financial Support: Not available

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