ORIGINAL ARTICLE

Prompt delivery of Thrombolytic therapy: Experience with chest pain units and emergency medical services

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Abstract

Objective: To reduce the reperfusion time with thrombolytics.

Methods: The study was done at Sheikh Zayed Hospital, Rahimyar Khan, between January and October 2009, and comprised all consecutive patients with ST segment Myocardial Infarction presenting to the hospital in emergency. In phase one, emergency medical services of Rescue 1122 were utilised to minimize transportation time and thrombolytics were instituted in the Emergency Department or the Coronary Care Unit. In Phase II, a chest pain unit was established in the Emergency Department and all patients were thrombolysed there. A proforma describing Total time, Door-to-needle time, demographics, reperfusion criteria, immediate and delayed complications was filled up for each patient. Comparative groups were analysed using Chi-square and Kruskal-Wallis tests, and $p<0.05$ was considered statistically significant.

Results: A total of 291 patients were enrolled. Of them 15 (5.15%) were rescued by the emergency medical services, while 276 (94.84%) presented themselves or were referred. Mean age was 51±11.5 years. There were 245 (84%) males. Thirty (10.30%) patients were thrombolysed at the Chest Pain Unit; 216 (74.22%) at the Coronary Care Unit; and 45 (15.46%) in the Emergency Department. Total time was 3:52, 5:29, and 4:55 hours respectively (p=0.003). Door-to-needle time was significantly reduced in the chest pain unit (p=0.0001). Total time was minimum in emergency medical services (p=0.0001). ST segment resolution >70% was maximum in the chest pain unit (p = 0.0001).

Conclusion: There was remarkable reduction in Total time utilising emergency medical services and door-to-needle time by establishing the chest pain unit. It is strongly recommended that such units be developed in all districts and tertiary care hospitals as a cost-effective facility.

Keywords: Emergency medical services, Chest pain units, Thrombolytic therapy. (JPMA 63: 194; 2013)

Introduction

Reperfusion therapy in ST Segment Elevation Myocardial Infarction (STEMI) is the major therapeutic goal.[1] Rapid initiation of reperfusion therapy for STEMI is achieved with either fibrinolytic therapy or primary percutaneous coronary intervention (pPCI).[2,3] In a country like Pakistan, where primary PCI is virtually not available to vast majority of our population, fibrinolysis remains the mainstay of reperfusion strategy. Fibrinolytic therapy instituted during the first hour has remarkable outcome[4,5] and even within 3 hours after symptom onset, can result in mortality reduction of up to 50%.[2,3]

In Pakistan, having few cardiac centres catering to major cities offering limited number of primary PCI, the majority of STEMI patients from rural and urban population are treated in emergency departments and coronary care unit (CCU) of general hospitals wherein timely delivery of thrombolytic treatment is hampered due to a number of reasons. Lack of awareness of symptom recognition by patients and their relatives, accurate appraisal by general practitioners (GPs), distance to facility and mode of transportation[6] are among the most important factors leading to delay in presentation, thus prolonging total time (TT) to treatment, and resulting in worse outcome in a large number of the patients. The Punjab government has established emergency medical services (EMS) Rescue 1122 in all the major districts of the province.[7] This is the first trained Emergency Rescue Medical Service established in Pakistan according to international training standards. The service is providing efficient and effective rescue and transportation to the helpless victims of accidents, emergencies and disasters.[8]

Furthermore, emergency departments (EDs) of general care hospitals in Pakistan, like most of the developing countries, are not providing prompt fibrinolysis and, hence, door-to-needle time (DNT) is higher than recommended.[9] The first chest pain unit (CPU) was

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developed in 1981,[10] to evaluate patients with chest pain and it has been shown that CPU care can reduce admissions, re-attendances and outpatient followup, and improve the quality of life for selected low-risk patients who are suitable for CPU care. However, CPUs are rarely used for thrombolytic treatment.[11]

The objective of the current study was to develop a protocol for speedy delivery of thrombolytic treatment in a general hospital within limited resources in order to achieve the recommended timing goal by international guidelines.[12] To achieve this goal we planned to utilise EMS services to cut short TT; established CPU to reduce DNT; and observed the outcome of these two interventions in STEMI patients.

Methods

All consecutive STEMI patients presenting to the ED of Sheikh Zayed Hospital, Rahimyar Khan from January to October 2009 were included in the study. There were two phases of the study: in the first phase, EMS of Rescue 1122 were utilised to reduce TT by removing transportation delay and ensuring speedy communication between cardiology services and Rescue 1122 ambulance staff. Injection Streptokinase (SK) was instituted either in the general emergency department or CCU.

In the second phase, a CPU was established within the existing ED in a separate room fully equipped with monitoring system and resuscitation trolley, in addition to rescue 1122 services, to reduce DNT. A trained medical officer from the cardiology department and a cardiac nurse were deputed. All patients with STEMI were thrombolysed in CPU and shifted to the CCU after stabilisation.

TT was defined as time from the onset of symptoms to the start of treatment, and the DNT as the time from arrival at the facility to the start of the treatment. A proforma describing patients' characteristics, demographics, TT, DNT, reperfusion criteria, immediate and delayed complications were filled in by the attending doctor. The data was entered and analysis was done using SPSS 16.0. Comparative groups were analysed using Chi-Square and Kruskal-Wallis tests and p <0.05 was considered statistically significant.

Results

A total of 291 patients with STEMI fulfilled the criteria for thrombolytic treatment. Only 15 (5.15%) patients were brought by Rescue 1122, while the rest of the patients presented on their own or were referred by GP/cardiologist. The age ranged between 22-90 years with a mean of 51±11.5 years. Males were 245 (84%); 106 (43%) were illiterate; and 136 (55.3%) belonged to urban areas. Only 2 (1%) were graduates and above. Regarding TT, there was statistically significant difference by mode of presentation. The minimum TT was in Rescue 1122 patients, and the minimum DNT was among the referred

Table-1: Effect of mode of presentation on timings.

Presentation	Total Time	DN Time
Rescue 1122	2:20	1:01
Self	5:25	1:22
GP/Cardiologist	5:03	00:57
P. Value	P<0.001	P<0.05

DNT: Door-to-Needle Time.

Table-2: Effect of venue on timings.

Venue	Total Time	DN Time
CCU	5:29	1:26
ED	4:55	1:17
CPU	3:52	00:28
P. Value	P 0.01	P < 0.0001

CCU: Coronary Care Unit. ED: Emergency Department. CPU: Chest Pain Unit.

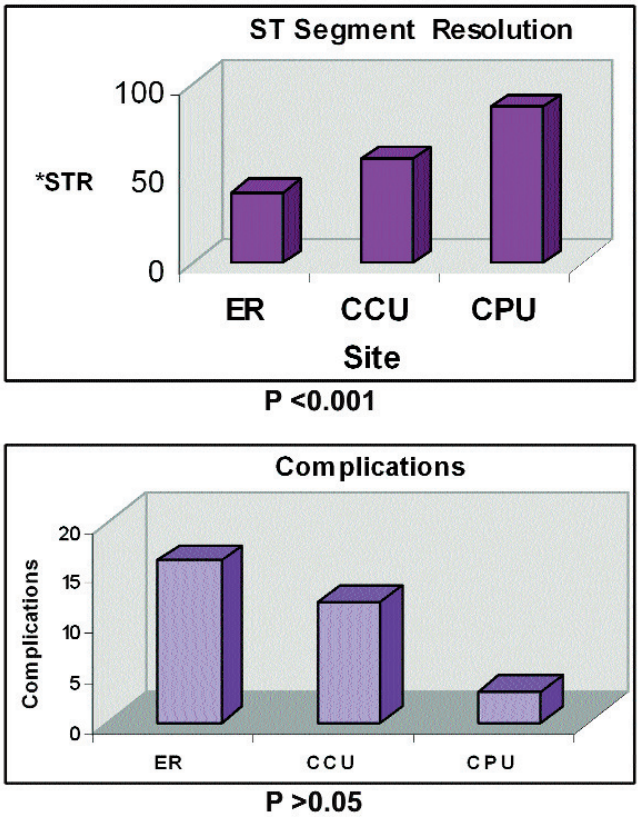

Figure-1: Effect of Venue on STR & Complications.

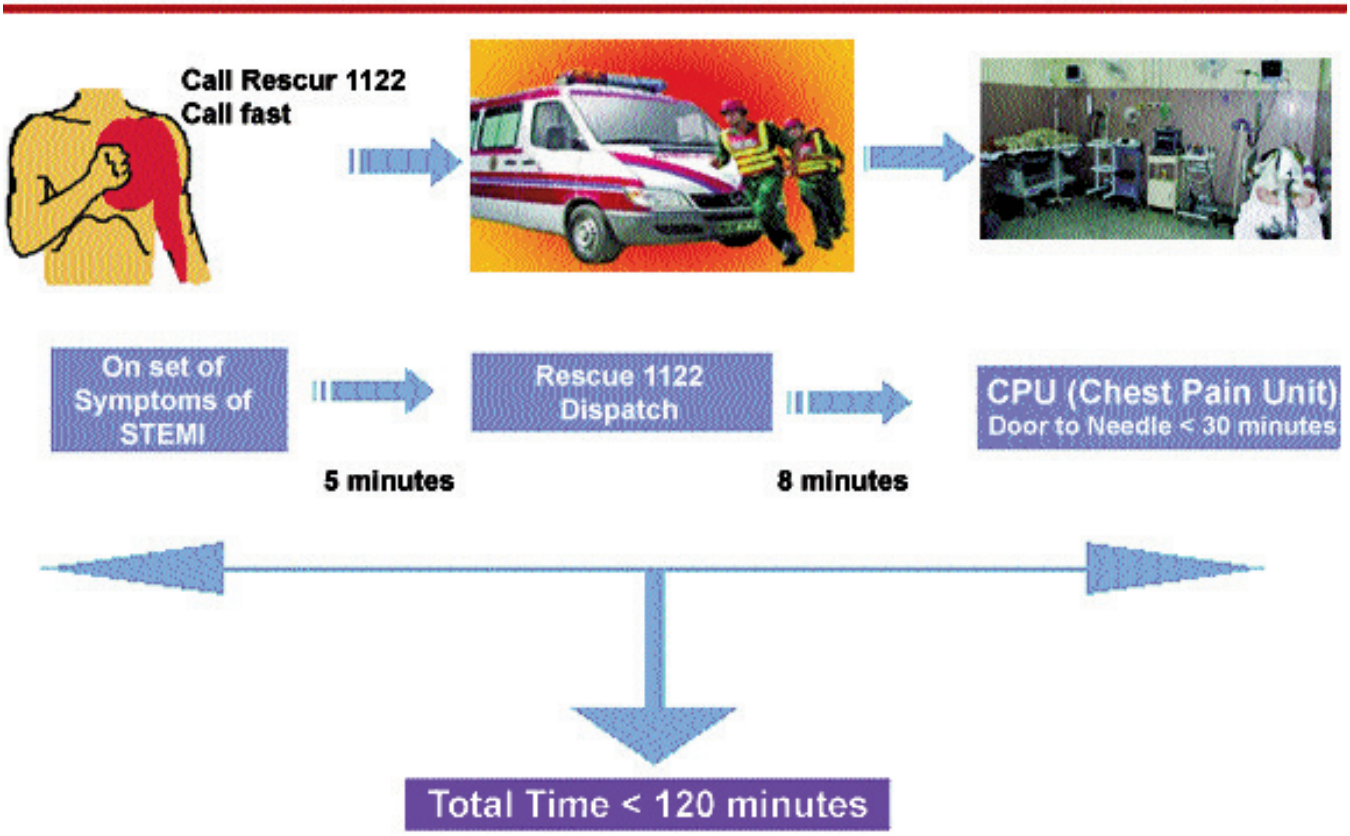

Figure-2: Model for speedy delivery of thrombolytic treatment in Pakistan.

patients (Table-1).

TT was reduced by 3:05hr in patients brought by Rescue 1122. Thirty (10.30%) patients were thrombolysed at CPU, 216 (74.22%) in CCU and 45 (15.46%) at ED. Total Time was 3:52 hour (CPU), 5:29 hour (CCU), 4:55hour (ED) (P = 0.003). Low level of education, rural residence and female gender had a negative effect on TT. Patients with TT <3hr had significant effect on ST segment resolution (STR) and complications.

The average DNT was 28 minutes in CPU, 1.17 hour (CCU), 1.26 hour (ED). The DNT was significantly dropped in CPU compared to ED and CCU (P = <0.0001), reaching the recommended time of <30 minutes (Table-2). There was reduction of 63 minutes in DNT at CPU versus CCU. The STR greater than 70% was maximum in CPU compared to ED and CCU (P = <0.0001). The STR and complications were significantly reduced by venue of thrombolysis (Figure-1).

Discussion

The patients who were brought in by EMS had a marked reduction in TT, which was reduced to almost half of the other modes of presentation. Since there wasn't a major difference in DNT, decrease in TT portrayed a lower transportation time than other modes. This can be attributed to the fact that Rescue 1122 is an ever available emergency facility which ensures quick response to emergency calls and speedy delivery to hospitals.[8] Both these advantages are not present when patients rely on home transportation alone. In developed countries, emergency services are equipped with the devices that transmit patient information, and even electrocardiographs, to the nearest hospital.[12] Hence, valuable time is not wasted in petty formalities, triage and initial assessments. Pre requisite arrangements can be made by the hospital and the patient can get immediate treatment. Pre-hospital administration of thrombolytics has even been well advocated in EMS[13,14] with favourable results. Low level of education, distance, lack of awareness regarding recognition of symptoms of MI are among the many factors which affect delayed presentation, hence increasing TT.[15-17] In our study, the female gender, lack of education and rural residence had significant impact on

prolonging TT.

The other important segment of our study is the establishment of CPUs in the ED of non-cardiac general hospitals. CPUs were first developed in the US with the intention to improve diagnostic accuracy, shorten hospital stay and save money.[18] In UK a significant number of hospitals are running CPUs.[19] However, the concept of CPU is still a novel idea in our country. In our study, the utilisation of CPU reduced the DNT to 28 minutes, hence affecting TT as a whole. This is the one factor that played the most significant role and achieved the goal of 30-minute DNT laid down by global guidelines. The time taken to transfer the patient to the CCU for thrombolysis may result in delayed treatment[20] and a patient with chest pain may not receive the required attention in the overcrowded ED with other equally serious patients fighting for the attention of limited number of doctors and staffs attention. In this situation, a CPU may be the most appropriate place, especially since increased DNT has been directly linked with increased mortality.[21] We introduced the concept of utilizing CPUs as a venue for thrombolysis, wherein previously the major role of CPUs had mainly been in assessment and monitoring of chest pain patients.

Patients with TT <3 hours also had a significant effect on STR and reduction in complications and a DNT <30min had a more favourable result. Hence, concerning mode of presentation and venue of treatment, it is understandable that presentation via Rescue 1122 and treatment in CPU had the most positive and encouraging results.

By combining Rescue 1122 and CPU, a total of 4hour and 8minutes were reduced in our study, having a remarkable improvement in managing STEMI patients. Therefore, we want to emphasise on two important aspects in the management of STEMI patients. First, is the use of EMS, and the second is the establishment of CPU within the existing emergency setup. Our Rescue 1122 services may not be as advanced yet as those of the developed countries. We suggest that our rescue teams be trained in symptom recognition, performing and interpretation of ECGs. A system should be created for prior warning to hospitals and ECG sent to CPU by telemetry. Furthermore, general awareness should be created in the public regarding the benefit of using Rescue 1122 over other modes of transportation. Secondly, our study proves the drastic improvement in timely delivery of thrombolytics with the use of CPU. It is the only situation in which global guidelines of DNT <30 minutes could be accomplished. This is a major achievement for us. Incorporation of CPUs in at least the major hospitals across the country may prevent a great deal of morbidity and mortality. We propose that in every ED, one room be allocated for this purpose, which should be fully equipped and staffed with trained personnel. It is not an insurmountable task, but it is an undertaking that can have a beneficial effect on the management of STEMI nationwide. We included all the 291 consecutive patients with STEMI presenting to the hospital within a certain period of time. However, the sample size was not estimated earlier, and this is a limitation of our study.

To continue, in the third phase we plan to intervene at the community level by creating awareness regarding recognition of chest pain symptoms in population at large, train GPs and rescue personnel for proper diagnosis of STEMI, pre-hospital ECG by Rescue personnel and their ability to read and interpret limited ECG tracings and ensure fast communication between CPU and Rescue 1122, in order to get prompt thrombolytic treatment.

Based on the findings of our study, we propose a model for the speedy delivery of thrombolytic treatment in Pakistan. Emergency medical services should be contacted at the onset of chest pain and the patients sent directly to CPU for evaluation (Figure-2). Integrating these two not-so-difficult strategies, a great deal of time may be saved, and when fighting a battle where 'time is muscle,' 'time' could mean the difference between life and death.

Conclusion

By utilizing EMS, remarkable improvement in the timing of fibrinolytic treatment was noticed. It is strongly recommended that CPUs be developed in EDs of all districts and tertiary care hospitals nationwide as a cost-effective facility with a great impact on morbidity and mortality related to STEMI. Besides, awareness must be created among population at large regarding the recognition of chest pain symptoms, and the benefits of utilising EMS.

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