# Fibrinolytic Therapy in CCU Instead of Emergency Ward: How It Affects Door to Needle Time?

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Original Article

## ABSTRACT

**Background:** The door-to-needle-time (DNT) is considered a standard time for scheduling thrombolysis for acute ST-segment elevation of myocardial infarction and this time can be reduced by minimizing the delay in starting thrombolytic treatment once the patient has reached to the hospital. This study was carried out on a sample of Iranian patients with acute myocardial infarction to determine the DNT in those after changing schedule of thrombolysis during 8 years from emergency to coronary care unit (CCU).

**Methods:** A descriptive cross-sectional study was carried out on all consecutive patients with a confirmed diagnosis of acute myocardial infarction admitted to the emergency ward of Ekbatan Hospital in Hamadan, Iran, within 2011 and had an indication of fibrinolytic therapy, which 47 patients were finally indicated to receive streptokinase in the part of CCU.

**Results:** The mean time interval between arrival at the hospital and electrocardiogram (ECG) assessment was 6.30 min, taking ECG and patient's admission was 21.6 min and transferring the patient from admission to CCU ward was 31.9. The time between transferring the patients to CCU ward and fibrinolytic administration order and the time between its ordering and infusion was 31.2 min and 14.0 min respectively. In sum, the DNT was estimated 84.48 ± 53.00 min ranged 30-325 min that was significantly more than standard DNT ($P$ <0.01). Furthermore, DNT mean in this study is significantly more than a study conducted 8 years ago in the same hospital ($P$ <0.01).

**Conclusions:** The DNT is higher than the standard level and higher than the estimated level in the past. This shows that DNT was longer after transferring to CCU.

**Keywords:** Door to needle time, fibrinolytic, myocardial infarction

## BACKGROUND

The management of acute ST-segment elevation myocardial infarction (STEMI) has been revolutionized by introducing and applying fibrinolytic therapy in medical settings leading to

reduced mortality and morbidity.[1-3] The use of these thrombolytic agents can limit infarct size, preserve left ventricular function and therefore improve patients' survival.[4-7] Despite considerable beneficial and vital impacts of this regimen, some potential barriers such as pre-hospital delay, financial constraints and lack of infrastructure have been identified especially in developing countries that limit this therapeutic method. Availability of some cheaper thrombolytic agents and the proper infrastructure could facilitate the use of fibrinolytic therapy in these countries.[8]

Delaying thrombolysis in affected patients may result in dramatically decrease of living preservation and serious disabilities. The data show that thrombolytic agents decrease overall 30-35 day mortality (18-25%).[9] In addition, delaying treatment by this regimen has been shown to be associated with higher 6-month mortality in patients with STEMI.[10] Thus, the timely identification and treatment of eligible patients should be strongly considered. The door-to-needle-time (DNT) has been recommended a standard time for scheduling thrombolysis for STEMI that has been based on the initial call for help or from the time of arrival at the hospital.[11] Obviously, this time can be reduced by minimizing the delay in starting thrombolytic treatment once the patient's arrival at the hospital. This study was carried out on a sample of Iranian patients to determine the DNT in those who undergo fibrinolytic therapy after acute myocardial infarction. The thrombolytic administration program has been changed for inducing a better condition during 8 years ago in this hospital. The aim of this study was to show the outcome of this change.

## METHODS

In this cross sectional study, all consecutive patients with a confirmed diagnosis of acute myocardial infarction (158 patients were diagnosed as a non-ST segment elevation myocardial infarction and 102 patients as STEMI) and had an indication of fibrinolytic therapy who were admitted to the Emergency ward of Ekbatan Hospital in Hamadan in 2011 were included. Based on the electrocardiogram (ECG) and discussion with the cardiologist, a decision for pharmacologic reperfusion or transfer of primary percutaneous coronary intervention was made. From 102 patients with STEMI, 47 were indicated to receive Streptokinase and other cases were not ordered to receive this drug because of revealed chest pain, traumatized cardiopulmonary resuscitation, resolution of ST-segment and other cases that had contraindications to fibrinolytic administration. Demographic and clinical data of all patients who were transmitted to the coronary care unit (CCU) and given fibrinolytic therapy were collected. Data regarding time were collected since the patient's arrival at the hospital. DNT was the interval between arrival at the hospital and administration of fibrinolytic therapy.

Statistical analyses were conducted using SPSS software version 16 (SPSS Inc, Chicago, USA). Descriptive data were expressed as mean values with a standard deviation and also median and IQR for continuous variables. One sample *t*-test was used to compare DNT with its standard, which has been reported as 30 min.[12] Furthermore, this time has been compared with a study conducted 8 years ago in the same hospital. $P < 0.05$ was considered to be statistically significant.

## RESULTS

In this survey, 47 patients were indicated to receive fibrinolytic therapy and treated with Streptokinase. The mean age was 62 ± 11.8. Demographic data have been shown in Table 1.

In Table 2 time interval between the onset of acute symptoms and fibrinolytic infusion according to different time period has been shown. In general, the time interval between arrival in Emergency ward and initial treatment with Streptokinase was estimated 84.48 ± 53.00 min ranged from 30 to 325 min that was significantly more than standard DNT.

(One sample *t*-test, $P < 0.01$). Furthermore, DNT mean in this study is significantly more than a study conducted 8 years ago in the same hospital (one sample *t*-test, $P < 0.01$).

## DISCUSSION

The current study was performed to present a proper estimation of the DNT defined as a time interval between arrival to the hospital and administration of fibrinolytic therapy in patients who were suffering acute myocardial infarction, when drug was injected in CCU and was compared

with drug injection in an emergency in the past. As mentioned above, the time obtained in our study was longer than standard and what was reported in this hospital 10 years ago. In a study conducted by Homauonfar in Ekbatana Hospital in Hamadan 8 years ago, the mean DNT was 45.22,[12] but in this study it has increased to 84.48. It seems that the door-to-physician-time is one important factor in increasing the DNT. Streptokinase injection was ordered by emergency clinician or cardiology resident and was injected by emergency nurse 10 years ago. However, currently, the patient must be transferred to CCU ward and a senior resident of cardiology must order the injection and the injection must be done in CCU by a nurse, which makes a great deal of increase in the DNT.

**Table 1:** Demographic description of study population

| Study population | Frequency (%) |
|---|---|
| Sex | |
| Male | 35 (74.5) |
| Female | 12 (25.5) |
| Occupation | |
| Housewife | 12 (25.5) |
| Unemployed | 9 (19.1) |
| Self-employed | 9 (19.1) |
| Retired | 8 (17) |
| Farmer | 6 (12.8) |
| Employed | 3 (6.4) |
| Residential place | |
| Urban | 26 (55.3) |
| Rural | 21 (44.7) |
| Age groups | |
| 43-52 | 10 (21.3) |
| 53-61 | 14 (29.8) |
| 63-70 | 9 (19.1) |
| 71-79 | 11 (23.4) |
| 80-88 | 3 (6.4) |

This show that another factor that seems to be responsible for delaying thrombolytic treatment is whether thrombolysis is administered in the emergency department or in the intensive or CCU. A similar result was reported by Alishahi from a study in Tehran's general teaching hospitals. He reported that one of the probable delay factors is the time required to transfer patients to the CCU, where the thrombolytic is administered. There is a reduction in the thrombolytic therapy administration time when it is administered in the emergency department.[13]

Although, the result was acceptable compared with some other reports. In a similar survey by Abba *et al*., the average DNT was 95 min. Meanwhile, the median time of onset of chest pain to arrival to the hospital was 300 min[14] that was higher than what was observed in this study. In another study by Muqueet *et al*., in three large tertiary referral hospitals, mean DNT was 147 min, which 55% of patients received thrombolysis within 90 min, 27% received within 91-180 min and even 6.18% received thrombolysis after 180 min.[15] The obtained prolonged DNT was not specified to developing countries, whereas similar results were reported from developed and industrial communities. In a similar study by Hirvonen in Finland, the median interval between the onset of infarction symptoms and initiation of thrombolytic therapy was 160 min ranged from 30 to 647 min, which only 13% of the patients received thrombolysis within 60 min and 38% within 120 min.[16] However, some clinical settings even in rural emergency departments achieved a successful improvement in shortening this time. In a large study in Canada, the median door-to-ECG time was 6 min, door-to-physician time was 8 min and DNT was 27 min, which 58% of patients received thrombolytics within 30 min.[17]

**Table 2:** Time interval between onset of acute symptoms of STEMI and administration of fibrinolytic infusion according to different time periods

| Time (min) | Min | Max | Median | Mean±SD | IQR (P25~P75) |
|---|---|---|---|---|---|
| Onset of acute symptom to arrival in hospital | 60 | 780 | 180 | 253±177 | 143~328 |
| Arrival in hospital to take an ECG | 0 | 65 | 5 | 6.3±9.5 | 0~9 |
| Taking ECG to admission | 1 | 65 | 17 | 21.6±13.8 | 12~28 |
| Admission to transfeering to CCU ward | 7 | 135 | 28 | 31.9±20.6 | 21~40 |
| CCU to fibrinolytic ordering | 0 | 170 | 15 | 31.1±44.6 | 5~30 |
| Ordering to infusion | 0 | 70 | 10 | 14±15.4 | 5~15 |

STEMI=ST-segment elevation myocardial infarction, ECG=Electrocardiogram, CCU=Coronary care unit, SD=Standard deviation, IQR=Interquartile range

The time to treatment with thrombolysis between non-working hours (NWH) and working hours at an Australian comprehensive stroke center was studied. It showed that the ''NWH effect'' increased the DNT.[18]

It seems that different reasons can be explainable for prolonging DNT.

It can be claimed that the most influential factor in determining the DNT is the door-to-physician-time that was also high in the present survey. The decision to administer thrombolytics cannot be made until the emergency physician has interpreted the ECG and evaluated the patient for indications and contraindications to the treatment. Logistically, this must be accomplished quickly if the 30 min or less goal is to be met and emphasizes the necessity of the early diagnosis of acute myocardial infarction.[19,20]

On the other hand, administrating the thrombolytic treatment in the emergency department can lead to a shorter DNT.[21]

Different guidelines have targeted various cut-off times for real and acceptable DNT. According to the guidelines presented by the American Heart Association and American College of Cardiology, jointly, the delay from patients contact with the health care system or the time between arrival to the hospital and initiating thrombolytic therapy should be arranged less than 30 min.[22] Furthermore The American College of Chest Physicians recommended that the thrombolytic treatment should begin within 30 min of arrival to the hospital.[23] In this study, we attentioned to one of factors that can affect DNT. For reaching to a standard level, we need to further study and induction different change in our hospitals.

## CONCLUSIONS

The DNT is higher than the standard level which is 30 in Ekbatan Hospital in Hamedan, Iran. This can be related to transferring the thrombolytic injection to CCU from emergency. Therefore, it should be minimized by considering all known factors which affect this time prolongation.

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