

Causes and Components of Pre-hospital and Hospital Delay of Treatment of Patients with Acute Coronary Syndromes in Egypt

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

﴿ قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا إِنَّكَ

أَنْتَ الْعَلِيمُ الْحَكِيمُ ﴾

صدق الله العظيم

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ABSTRACT 1

Pre-Hospital and Hospital Delay of Treatment in Patients with Acute ST Elevation Myocardial Infarction in an Egyptian Tertiary Care Center

Purpose: Time is crucial in the management of acute ST elevation myocardial infarction (STEMI). Delays in presentation and treatment reduce the efficacy of reperfusion therapy and the chance of myocardial salvage. The delay varies widely across different countries because of different patients' profile and different healthcare capabilities. The pre-hospital delay, hospital delay and total ischemic time have not been reported in Egyptian tertiary care facilities.

Methods: From August 2013 to April 2014, we included all patients with STEMI who presented within 24 hours of symptom onset. We recorded the time between the onset of acute severe symptoms and arrival to the hospital (pre-hospital delay). We categorized pre-hospital delay as either patient-related (time passed before patients decided to go to hospital) or transportation-related. We also recorded the time between arrival to hospital and the institution of reperfusion therapy -thrombolysis or primary PCI- (hospital delay). We categorized hospital delay causes as staff-related (lack of trained personnel or physician inertia) or system-related (shortage of beds or consumables).

Results: We recruited 81 patients, 53 (65.4%) were males, 48 (59.3%) had hypertension, 43 (53.1%) had diabetes, 37 (45.7%) were smokers and 32 (39.5%) had prior history of cardiac diseases. Twenty-three patients (28.4%) had primary PCI and 58 patients (71.6%) received thrombolytic therapy. The mean pre-hospital delay was 5.0 ± 3.0 hours. 44% of that time was patient-related and 56% was spent in transportation. Only 2 (2.5%) patients used an ambulance, the rest of patients used their private cars (43.2%), taxi (43.2%) or public buses (11.1%). The mean door to needle time was 94.1 ± 31.8 minutes while the mean door to balloon time was 153.2 ± 39.4 minutes. 31% of hospital delay was system-related while 53% was staff-related. The mean total ischemic time was 6.5 ± 3.3 hours for thrombolysis and 7.8 ± 2.7 for PCI.

Conclusion: The delay is considerably longer than that reported in literature. The priority to improve pre-hospital delay should be given to facilitate transportation through ambulances. Efforts to shorten hospital delay should focus on better bed management and more supply of consumables.

Keywords: Pre-hospital delay, Hospital delay, Delayed reperfusion therapy.

ABSTRACT 2

Pre-Hospital and Hospital Delay of Treatment in Patients with non-ST Elevation Myocardial Infarction/Unstable Angina in an Egyptian Tertiary Care Center

Purpose: Because patients cannot differentiate whether chest pain is due to STEMI or non-STEMI/UA, early presentation is desirable in all cases of acute prolonged chest pain. Early recognition of the cause of acute chest pain and early institution of therapy seems to be beneficial. Causes of delayed presentation vary widely across different countries because of different patients' profile and different healthcare capabilities. Pre-hospital delay, hospital delay and the total ischemic time have not been reported in Egyptian tertiary care facilities.

Methods: We included all patients who were admitted with non-STEMI/UA in our center from March 2013 to March 2014. We recorded the time between the onset of acute severe symptoms and hospital arrival (Pre-hospital delay). We also recorded the time between the arrival to hospital and the institution of guideline-dictated medical therapy (hospital delay). We classified pre-hospital delay as either patient-related (time spent before patients decided to go to hospital) or transportation-related. We categorized hospital delay causes as staff-related (lack of trained personnel or physician inertia) or system-related (shortage of beds or consumables).

Results: We recruited 219 patients, 139 (63.5%) were males, 150 (68.5%) patients had hypertension, 104 (47.5%) had diabetes, 75 (34.2%) were smokers and 156 (71.2%) patients had prior history of cardiac diseases. The mean pre-hospital delay was 10.0 ± 10.6 hours. 65% of pre-hospital delay was patient-related and 35% time was spent in transportation. Only 9 (4.1%) patients came by ambulance, the rest of patients used their private cars (26.5%), taxi (51.1%) or public buses (17.8%). The mean hospital delay time was 146.5 ± 58.0 minutes. 87.7% of hospital delay was system-related while 6.4% of the delay was staff-related. The mean total delay time to definitive therapy was 12.4 ± 10.7 hours.

Conclusion: In UA/NSTEMI, pre-hospital delay was mainly patient-related, despite that most of patients had prior history of cardiac disease. The priority to improve pre-hospital delay should be given to patient education. Efforts to shorten hospital delay should focus on better bed management and more supply of consumables.

Keywords: Pre-hospital delay, Hospital delay, NSTEMI, Unstable angina.

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List of Abbreviations

ACC	: American College of Cardiology.
ACE	: Angiotensin Converting Enzyme.
ACS	: Acute coronary syndromes.
ACUITY	: Acute Catheterization and Urgent Intervention Triage strategY
ADP	: Adenosine diphosphate.
AHA	: American Heart Association.
AMI	: Acute Myocardial Infarction.
aPPT	: Activated Partial Thromboplastin time.
ARBs	: Angiotensin Receptor Blockers.
ASA	: Aspirin.
AV	: Atrioventricular.
BNP	: Brain Natriuretic Peptide.
CABG	: Coronary Artery Bypass Grafting.
CAPTIM	: Comparison of Angioplasty and Prehospital Thrombolysis in acute Myocardial infarction.
CAD	: Coronary Artery Disease.
CCD	: Calcium Channel Blocker.
CCS	: Canadian Cardiovascular Society Classification.
CCU	: Coronary Care Unit.
CLARITY-TIMI	: Clopidogrel as Adjunctive Reperfusion Therapy - Thrombolysis in Myocardial Infarction.
CHF	: Congestive Heart Failure.
CK	: Creatine Kinase.
CK-MB	: Creatine Kinase-isoenzyme MB.
COMMIT	: Clopidogrel and Metoprolol in Myocardial Infarction.
CPR	: CardioPulmonary Resuscitation.
CT	: Computed Tomography.
CURE	: Clopidogrel in Unstable angina to prevent Recurrent Events.
D2BT	: Door-to-Balloon Time.
D2DT	: Door-to-Drug Time.
D₅W	: 5% Dextrose in Water.
D.M	: Diabetes Mellitus.
ECG	: ElectroCardioGram.
eCRF	: Electronic Clinical Report Form.
ED	: Emergency Department.
EMS	: Emergency Medical Services.
EPHESUS	: Eplerenone Post-Acute Myocardial Infarction Heart Failure Efficacy and Survival Study.
ER	: Emergency Room.
GP	: GlycoProtein.
GRACE	: Global Registry of Acute Coronary Events.
HbA1c	: Hemoglobin A1c.
HDL	: High- Density Lipoprotein.

hr	: Hour.
ISIS-2	: Second International Study of Infarct Survival.
I.V	: IntraVenous.
INR	: International Normalized Ratio.
JVP	: Jugular Vein Pressure.
LA D	: Left Anterior Descending Artery.
LDL	: Low-Density Lipoprotein.
LMWH	: Low-Molecular-Weight Heparins.
LV	: Left Ventricular.
LVEF	: Left Ventricular Ejection fraction.
MI	: Myocardial Infarction
N	: Number
NSTEM	: Non-ST elevation Myocardial Infarction.
NTG	: Nitroglycerin.
NT-proBNP	: N-Terminal of the prohormone Brain Natriuretic Peptide.
OASIS	: Organization for the Assessment of Strategies for Ischemic Syndromes.
PCI	: Percutaneous Coronary Intervention.
PHT	: Pre-Hospital Time.
PO	: Per-Oral.
PTCA	: Percutaneous Transluminal Coronary Angioplasty.
PVD	: Peripheral Vascular Disease.
qd	: Every Day.
RAAS	: Renin-Angiotensin-Aldosterone System.
RV	: Right Ventricular.
SD	: Standard Deviation.
STEMI	: ST-segment Elevation Myocardial Infarction
TRITON-	: Trial to Assess Improvement in Therapeutic Outcomes by
TIMI	Optimizing Platelet Inhibition with Prasugrel–Thrombolysis in Myocardial Infarction.
UFH	: UnFractionated Heparin.
UA	: Unstable Angina.
VALIANT	: VALsartan In Acute myocardial iNfarcTion.
VLDL	: Very-Low-Density Lipoprotein.
VF	: Ventricular fibrillation.

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INTRODUCTION

The burden of cardiovascular disease is growing worldwide. Ischemic heart disease is the No. 1 cause of death in the United States and other developed countries and is projected to emerge as the No. 1 cause of death worldwide by the year 2020.¹ Acute coronary syndromes (ACS) constitute a major cause of morbidity and mortality worldwide. Non-ST elevation myocardial infarction (NSTEMI) and unstable angina (UA) account for about 2.5 million hospital admissions annually worldwide, while ST-segment elevation myocardial infarction (STEMI) accounts for another 1 million.² The incidence of acute coronary syndromes including acute myocardial infarction is increasing.

Time is a crucial issue in the management of acute myocardial infarction in particular. Earlier presentation will allow earlier reperfusion which promotes more myocardial salvage. During the last few decades, we have learned that, in the setting of an ACS, time means saved myocardium. The meaning behind this statement is that, the earlier this treatment is initiated, the greater the likelihood that myocardial damage will be limited and myocardial function will be maintained.³

ACC/AHA guidelines state a target of door-to-needle time of 30 minutes and a door-to-balloon time of 90 minutes. STEMI usually results from acute thrombotic occlusion of a coronary artery and is a leading cause of death. Although myocardial cell injury can occur after 20 to 30 minutes of ischemia, it takes several hours for transmural myocardial necrosis to

develop. The goal of reperfusion therapy with fibrinolytic drugs or primary percutaneous coronary intervention (PCI) is to restore blood flow to ischemic, but still viable, myocardium and reduce infarct size.⁴ Current guidelines emphasize the need to make every effort to minimize all time delays, especially within the first 2 hours after onset of symptoms, by the implementation of a system of care network.⁵

A number of factors are involved in the delay between the onset of ACS and the start of various treatments. The most important one is most probably the patient him/herself. Over the years, patient delay has generally been defined as the time between the onset of symptoms and arrival at hospital. However the delay can be divided into various components, where the pre-hospital and in-hospital delays make up the two main components.⁶

Pre-Hospital delay is defined as the time from onset of symptoms till arrival to the point of definitive care. In the United States, median delay time from symptom onset to hospital arrival ranges from 1.5 to 6.0 hours. It is estimated that each additional 30 minutes of delay increases 1-year mortality by 7.5%.⁷ It is also a significant problem worldwide. For example, in one study conducted in Australia; median delay time was 6.4 hours. In many European countries such as Britain and Sweden, pre-hospital delay times are notably longer than those reported in the United States.¹

Hospital delay is defined as the time from arrival to the point of definitive care till the start of conclusive therapy. The majority of patients receive intravenous thrombolysis as the primary method of reperfusion. Unfortunately, many patients present late to medical facilities with this life-

threatening situation which results in marked diminution of the efficacy of intravenous thrombolysis. Delayed presentation also reduces the efficacy of primary PCI in myocardial salvage. Sometimes the delay is caused by failure of the first physician in contact to diagnose the condition. So, Hospital delay represents another problem. Even after establishing the diagnosis, there is a need to institute therapy as fast as possible.⁸ The delay in treating acute MI and ACS varies widely across different countries.⁹

Ischemic heart disease is the leading cause of death in Egypt. The project “Stent for Life” endorsed by the Egyptian Society of cardiology was launched to expedite and facilitate primary PCI for patients with STEMI. The endeavor of this project needs to be supported by other initiatives that reduce patients and hospitals delay in treatment.¹⁰ In a study of 288 patients with STEMI in three public hospitals in Port Said, 45% of patients missed thrombolysis because of either delayed presentation or misdiagnosis. There is a real need to study the extent and causes of pre-hospital and hospital delay in a multicenter nationwide scale.¹¹

Given the lack of current data for extent of pre-hospital and hospital delay in Egyptian patients with an ACS from different population settings, we need more data and investigation for these causes of delay in different hospitals as part of a multicenter coronary disease registry in Egypt.

Aim of the work

The aim is to quantify the delay experienced by Egyptian patients with acute coronary syndromes and to identify the causes of this delay. The two general broad components of delay are the pre-hospital and the hospital delay.