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# Time to treatment in patients of suspected acute coronary syndrome in Pakistan: A clinical audit

Munawar Khursheed, MD [a,*,c], Jabeen Fayyaz, MBBS, FCPS [a], Asher Feroze, MSc [a], Nishi Shakeel, MBBS, MCPS [a], Junaid A. Bhatti, PhD [a,b,c]

[a] Department of Emergency Medicine, Aga Khan University, Karachi, Pakistan
[b] Sunnybrook Health Sciences Centre Research Institute, Toronto, Canada

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ABSTRACT

*Objective:* Evaluate time to treatment (TT) in suspected acute coronary syndrome (ACS) patients in the Emergency Department (ED) in Pakistan.
*Methods:* In this clinical audit, medical records of adult patients with suspicion of ACS visiting the ED of a tertiary care facility in Karachi from January to March of 2012 were reviewed and evaluated according to benchmarks from American College of Cardiology/American Heart Association guidelines.
*Results:* Study included 230 patients, of which 62.6% were males ($n = 144$). Physicians saw most patients (74.1%) in ≤10 min (min) of ED triage. ECG was performed in ≤10 min in 93 (47.7%) patients. Of the 207 patients being prescribed Aspirin, 41.9% received it in ≤10 min. Of 155 patients who were prescribed anti-coagulants (e.g., heparin), 32.9% received them in 10 min. Half of the patients requiring primary coronary intervention underwent the procedure within 90 min.
*Conclusion:* Findings warrant exploring interventions to improve TT for ACS care in resource-limited settings.



## Introduction

Acute coronary syndrome (ACS) encompasses a variety of clinical scenarios that follow a sudden decrease in blood flow to the myocardial cells; it includes ST-elevation myocardial infarction (STEMI), non-ST elevation myocardial infarction (NSTEMI), and unstable angina.[1,2] Data from developed countries show that suspected ACS, often synonymized with chest pain, is a common Emergency Departments (ED) admission diagnosis.[3–5] The studies from the United States (US) showed that chest pain accounted for 2–6% of the ED patients.[6–8] A study from the United Kingdom (UK) showed that while chest pain accounted for 6% of ED visits, it led to almost 27.4% of hospital admissions because of ACS suspicion.[4] Accurate burden assessment of patients with ACS suspicion in low- and middle-income countries (LMICs) is mostly unavailable, however, crude estimates indicate that the burden of ACS has been steadily increasing over the last decades in LMICs.[9–11]

ACS care quality depends on many factors including timely diagnosis.[12,13] Underdiagnosis is not uncommon as electrocardiogram (ECG) changes can be non-specific in half of the ACS patients.[4] The studies noted that the short-term mortality was twice as high in patients who were mistakenly discharged from the ED than those who were admitted to the hospital.[14,15] The introduction of sensitive biomarkers like creatine kinase isoenzyme MB (CK-MB) and troponins have substantially improved the timely diagnosis.[16] Still the proportion of underdiagnosis in the patients of ACS can be as high as 2–6% even in resourceful settings.[15–17] ACS management guidelines are regularly revised to guide diagnosis in ED settings.[1,6,18]

In addition to diagnosis, timeliness in management is a major determinant of ACS care outcomes. Guidelines recommend monitoring time to different treatments in ACS patients to evaluate the quality of care. For instance, in primary percutaneous coronary intervention (PCI) for acute ST-elevation MI (STEMI),[19] the door-to-balloon time, defined as the time interval between arrival of an ACS patient at the hospital and the intracoronary balloon inflation,[20] is a key indicator for evaluating the quality of acute STEMI care.[21] Studies have shown higher mortality if door-to- balloon time exceeds 2 h.[21,22] Therefore, the benchmark standard of 90 minutes (min) has been set in the clinical practice guidelines of United States and Europe.[6,18,23] Similar benchmarks exist for providing other essential treatments

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* Corresponding author. Aga Khan University, Stadium Road, P.O. Box 3500, Karachi 74800, Pakistan. Tel.: +92 21 3493 0051x1170/4573; fax: +92 21 3493 4294.
*E-mail address:* munawar.khursheed@aku.edu (M. Khursheed).
[c] These authors contributed equally to this study.

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(e.g., aspirin) to the ACS patients. Times to treatments are, therefore, important indicators of the quality of care.[12]

The challenges of suspected ACS management can be different in LMICs.[24,25] Based on resources such as human capacity and workload, the treatment outcomes are expected to be heavily affected by the delays in the care processes.[4,15,17,24] It is assumed that time to treatment in ACS management is longer in LMICs than high-income countries, and contributes to poor outcomes.[24,25] The recent ACS care audits in LMICs such as Pakistan have raised the questions on quality of ACS care, but none of the investigations has assessed delays in time to ACS treatment.[26–28] This becomes more important as the health care facilities in LMICs now aim to follow the international ACS treatment guidelines including those for PCI.[10,11,29–31]

Few facilities in LMICs, however, have monitoring systems for quality assurance of ACS care.[10,11] In December 2010, a large private care facility in Pakistan, a low-income country, implemented an ACS management protocol based on American College of Cardiology (ACC)/American Heart Association (AHA) guidelines,[18] which also promoted documenting time for different treatments in the medical records. This represented an opportunity to evaluate the timeliness in the ACS care process in an LMIC like Pakistan.[26–28] The purpose of this study was to evaluate time to various treatments, such as time taken for an ECG, aspirin, or PCI, in suspected ACS patients in a Pakistani hospital.

## Methods

### *Design & setting*

We conducted a clinical audit of medical records based on the National Institute of Clinical Excellence guidelines.[32] The study setting was the emergency department (ED) of a private tertiary care hospital (Aga Khan University Hospital, Karachi, Pakistan). This facility is a Joint Commission International Accredited hospital.[33] It receives, on average, over 49,000 patients per annum. The ED is a 48 bed facility comprised of an adult critical care area, an adult non-critical care area, a fast track clinic, a clinical decision unit (CDU) and a separate designated pediatric area. The ED staff works in a three-shift system: morning shift from 0700 to 1500 h, evening from 1500 to 2300 h and night from 2300 to 0700 h. The ED has a well-defined triage criteria and an electronic patient information database system.

### *Sample*

Inclusion criteria were: 1) aged 16 years or more (this cut-off is followed in most health care facilities in Pakistan to exclude pediatric patients; male patients of 16 years or older are admitted to adult male wards whereas female patients of the same age are admitted in adult female wards); 2) presenting to the ED with complaints of chest pain or symptoms suggestive of ACS as mentioned in the notes at the time of admission to the ED; 3) deemed as an urgent case at the registration desk. All patients were triaged using Emergency Severity Index-IV (ESI-IV). ESI-IV defines five levels of severity (P1–P5) to prioritize care at ED.[34] Levels P1 and P2 receive immediate care at the ED. This study included suspected ACS patients who were assigned to P1 or P2 categories at the registration desk. In order to estimate the time to different treatments, we assumed that 60% of ACS patients were managed as prescribed in guidelines with a precision of 10% and 95% confidence intervals. The computations showed that approximately 100 patients per type of treatment were required to estimate the time to treatment. Since there existed the possibility that not all patients were prescribed same types of treatments, we decided that conducting an audit for patients presenting in three months i.e., from 1st January 2012 to 31st March 2012 would be sufficient to recruit a sample of over 100 patients.

### *Data collection*

A one-page study-specific data collection tool (33 items) was used to collect data from medical records. The tool was developed from a literature review of international guidelines on time to treatment[1–4,7,11,35] and consensus by the two principal investigators (MK and FJ) who were emergency medicine specialists. Items related to the patients' demographics and electrocardiographic findings, as well as a list of symptoms and treatments, were included in the tool. The tool was pilot tested with 25 patients (not included in this study). A research assistant trained during the pilot phase extracted data from the medical records under the guidance of two investigators. Fifteen percent of all the entries were randomly verified by the investigators. The data collection included items to assess patient's: demographic information (gender and age), presenting complaints (chest pain, shortness of breath [SOB], dizziness, sweating, radiation of pain), ED outcome (discharged from ED or admitted in hospital), reason of discharge (e.g., discharge by physician including left against medical advice [LAMA], transferred, expired, not reported), and diagnosis at ED discharge or hospital admission (e.g., chest pain, STEMI, NSTEMI, angina). Based on ACC/AHA guidelines and clinical meaningfulness,[18] the investigators retained the following elements for extracting time to treatment where available: time between triage at the registration desk and physician seen; time from physician seen to electrocardiogram (ECG) done; time from prescription of drugs including anticoagulants (aspirin, beta-blockers, heparin, enoxaparin) to their administration; time from prescription of cardiology consult after being prescribed by ED physician; time to PCI, i.e., from the registration desk to PCI (or door-to-balloon time). Two other time variables were extracted as well: length of stay (LOS) at ED, i.e., from the registration desk to being discharged from ED, and LOS at the hospital, i.e., from admission to the hospital to discharge from hospital. The latter were extracted only in patients where PCI was performed.

### *Analyses*

Descriptive statistics were used to describe the sample. The number of cases with missing values were mentioned and not included while computing proportions or means. Time taken to be seen by physicians, time to ECG, time to drug administration, and time to cardiology consult were divided into three categories: $\leq$10 min, in 11–30 min and after 30 min. The cut-offs of 10 min and 30 min have been used previously in ACS care research some of which were set as benchmarks by the ACC/AHA.[6,7] For PCI, the door-to-balloon time was divided as $\leq$90 min and $>$90 min based on the ACC/AHA guidelines.[18] Time to treatment was not available for all patients. We reported proportions for the above categorizations based on available values. Length of stay was compared among categories of ED outcomes (discharged from ED or admitted to the hospital) and door-to-balloon time ($\leq$90 min and $>$90 min) using Mann–Whitney *U*-test with alpha set at 0.05%. Data were analyzed using SPSS version 19.0.

## Results

### *Sample*

The total number of patients who presented at ED in three months were 11,754, of which 38.4% ($n$ = 4,515) were admitted. Of all who presented at ED, 230 patients (2.0%) were identified as suspected ACS (meeting inclusion criteria) from the medical records (Table 1); 144 (62.6%) were males and 86 (37.4%) were females. Mean age was 58.9 years (standard deviation [SD] = 13.7, range 27–88 years). Chest pain and vomiting were the common