



## Research paper

# Factors associated with triage assignment of emergency department patients ultimately diagnosed with acute myocardial infarction



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## ABSTRACT

**Background:** The objective of this study was to explore factors associated with the triage category assigned by the triage nurse for patients ultimately diagnosed with acute myocardial infarction.

**Methods:** This was a retrospective analysis of 12 months of data, on adult emergency department patients ultimately diagnosed with acute myocardial infarction. Data were obtained from hospital databases and included patient demographics, patient clinical characteristics and nurses' experience.

**Results:** Of the 153 patients, 20% (95% CI: 14–27%) were given a lower urgency triage category than recommended by international guidelines. Compared to patients who were triaged Australasian Triage Category 1 or 2, patients with an Australasian Triage Category 3–5 were older (mean age 76 versus 68 years), more likely to be female (63% versus 32%), more likely to present without chest pain (93% versus 35%) and less likely to have a cardiac history (3.3% versus 17.9%). A slightly higher proportion of patients Australasian Triage Category 3–5 were triaged by an experienced nurse (50%) compared to patients categorised Australasian Triage Category 1–2 (35.2%) but this finding did not reach statistical significance.

**Conclusions:** One in five presentations was given a lower urgency triage category than recommended by international guidelines, potentially leading to delays in medical treatment. The absence of chest pain was the defining characteristic in this group of patients, along with other factors identified by previous research such as being of female sex and elderly.

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## 1. Introduction

Acute Myocardial Infarction (AMI) is a leading cause of premature death and disability for Australian men and women.<sup>1</sup> Rapid assessment and treatment of patients with AMI is essential as mortality associated with AMI is directly linked to time taken to receive treatment.<sup>2,3</sup> The initial clinical assessment for patients

who present to hospital emergency department (ED) occurs by a triage officer. In most Western countries, the triage officer is a registered nurse who has specialised in emergency nursing. The key role of the triage nurse is to accurately identify potential patients who may have an AMI as early as possible to expedite necessary immediate cardiac care.<sup>4</sup>

Triage is a system which allows the clinical urgency of a presenting problem to be categorised. Similar 5-level triage systems are used in Canada (the Canada Triage and Acuity Scale),<sup>5</sup> Europe, the United Kingdom (the Manchester Triage scale) and Australia (the Australasian Triage Scale (ATS))<sup>6,7</sup> (Web Appendix 1). In Australia, experienced ED nurses complete mandatory training from the Emergency Triage Education Kit (ETEK) and must be well

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versed with the ATS. The ATS ranges from 1 to 5 with the ranking correlating with the recommended maximum time a patient should wait for treatment. Patients categorised as ATS 1 require immediate treatment, while patients categorised as ATS 2, 3, 4 or 5 are expected to receive medical assessment and treatment within 10, 30, 60, and 120 min respectively.<sup>8</sup> In line with the Australasian College of Emergency Medicine guidelines and the ETEK, a patient presenting with symptoms suggestive of Acute Coronary Syndrome (ACS) should be triaged as a Category 2.<sup>9,10</sup> These symptoms may include acute chest, epigastric, neck, jaw, or arm pain; or discomfort or pressure without an apparent non cardiac source.<sup>11</sup>

According to the ETEK, 'under-triage' describes the process whereby the patient receives a triage code lower than their actual level of urgency.<sup>10</sup> Although Australian data are lacking, international research suggests a significant number of patients with AMIs are under-triaged, with one study finding up to half of all AMI patients being assigned a lower priority triage category on presentation.<sup>5</sup> The reasons for under-triage of AMI patients have not been adequately elucidated, though research suggests factors including age, sex, an absence of chest pain at triage, and history of diabetes mellitus or heart failure make AMI harder to recognise.<sup>12–14</sup> Given that triage is a modifiable factor influencing delays to treatment, further understanding of the determinants of triage category in an Australian setting is an essential step in enhancing the triage process.

### 1.1. Purpose of the study

This study explored the triage category assigned to patients with myocardial infarction in a large tertiary hospital ED in Queensland, Australia. The study aim was to identify the factors associated with the triage of patients presenting to ED with AMI. Predictors of interest included patient demographics, clinical characteristics and nursing triage experience.

## 2. Patients and methods

### 2.1. Study design and setting

This was an analysis of retrospective collected data on adult patients presenting to the ED who were ultimately diagnosed with AMI. The data were collected from the Royal Brisbane and Women's Hospital (RBWH) between 1 June 2009 and 31 May 2010. The RBWH is a 929 bed adult tertiary-referral teaching hospital; the RBWH ED has an annual attendance rate of 72,000 patients over the age of 14 years. This paper reports the findings of a research study that adhered to the National Statement on the Conduct of Human Research by the Australian National Health and Medical Research Council, and has been approved by the RBWH Human Research Ethics Committee on the 30th April 2010.

### 2.2. Case selection and data collection

Patients with an AMI were identified through several sequential steps. The RBWH pathology department provided a list of all patients who presented to the ED and had a serum troponin I (TNI) performed as part of their emergency workup. This list was then refined to include only those patients with a TNI value of  $\geq 0.06$  mcg/L. The TNI assay used in at the RBWH during the study period was the Beckman Coulter AccuTnl assay and 0.06 was the clinical decision cut-off point. The next step was to undertake a review of the discharge diagnosis on the Emergency Department Information System (EDIS) to confirm a diagnosis of AMI for those patients. Patients with an EDIS diagnosis of 'Chest Pain' or 'Acute Coronary Syndrome' (ACS) were further examined to identify whether they had a diagnosis of AMI on the

**Table 1**  
Baseline characteristics of the cohort ( $n = 153$ ).

Characteristic	$n$ (%)
Mean $\pm$ SD age (years)	69.5 $\pm$ 14.4
Male sex	94 (61.4)
English as primary language	144 (94.1)
Employment status	
Employed	42 (27.5)
Pensioner	82 (53.6)
Unemployed	12 (7.8)
Other/unknown	17 (11.1)
Mode of arrival to emergency department	
Own transport	39 (25.5)
Ambulance service	114 (74.5)

index admission. This initial examination was undertaken using charts and electronic medical discharge summaries where the diagnosis was documented by a cardiologist or general physician.

For the purposes of this study, AMI included diagnosis of AMI (NSTEMI or STEMI) on the index admission or urgent revascularisation on index admission including coronary angioplasty, coronary artery stenting and coronary artery bypass grafting. Exclusion criteria included pregnancy, age < 18 years and any patients transferred to the ED from another hospital.

Once the population was identified, study data were obtained from a number of sources. Data on patient demographics (age and sex), presenting symptoms, cardiac history, ambulance use and triage category were collected from the EDIS database. Presenting symptoms were categorised as typical or atypical for AMI. Typical symptoms referred to the presence of any chest pain during the event (present or resolved on arrival), while atypical symptoms included dizziness, syncope, nausea or vomiting and dyspnoea with the absence of chest pain prior to arrival or during presentation.<sup>15–17</sup> The name of the nurse who triaged the patient was provided from the ED admission system, and the years of nursing triage experience was then sought from the ED Nurse Educator's records. Data was de-identified prior to analysis.

### 2.3. Data analysis

Data were analysed using SPSS version 20. Baseline characteristics of the sample were reported. A triage category of 1 or 2 was categorised as high urgency while a triage category of 3–5 was deemed lower urgency. Standard descriptive statistics were used to report the characteristics of the correctly triaged and under-triaged patient groups. Chi-square tests (or Fisher's exact tests where cell sizes were small) were performed to compare dichotomous data across triage categories. *T*-tests were performed to compare continuous characteristics across triage categories. There only were a small number of patients with an ATS 3–5 ( $n = 30$ ) and so it was not deemed appropriate to perform multivariable analyses to identify the independent predictors of triage category.

## 3. Results

There were a total of 153 patients identified with an index AMI for analysis. The sample included 94 (61.4%) males and the mean age was 69.5 years ( $SD = 14.1$  years). Baseline characteristics of the cohort are provided in Table 1 and demonstrate that the majority of the patients were English-speaking pensioners who arrived via ambulance. One hundred and twenty three (80.4%, 95% CI: 73.2–86.4%) patients were provided an appropriate triage category (ATS 1–2).

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