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Letters:

Factors associated with decision time for patients with ST-segment elevation acute myocardial infarction*

Lu QIAN[§1], Kang-ting JI[§1], Jin-liang NAN[1], Qin LU[1], Yong-jin ZHU[1], Lu-ping WANG[1], Lian-ming LIAO[†‡2], Ji-fei TANG[†‡1]

([1]*Department of Cardiology, the Second Affiliated Hospital, Wenzhou Medical University, Wenzhou 325000, China*)
([2]*Academy of Integrative Medicine, Fujian University of Traditional Chinese Medicine, Fuzhou 350112, China*)
[†]E-mail: llm@fjtcm.edu.cn; jefftang@medmail.com.cn
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Increased delay in visiting a hospital for patients with ST-segment elevation myocardial infarction (STEMI) is often associated with poor outcomes. The factors associated with the decision time were analyzed by comparing the characteristics of patients with delays longer or shorter than the median of 60 min. Pre-hospital delay tended to be longer for patients living in suburban areas compared to those in urban areas (*P*=0.015). Shorter decision time was more likely among older patients. Being married, medical insurance coverage, and the level of educational qualification did not affect decision time. More efforts should be paid to educate the patients with high risk in suburban areas in order to effectively reduce pre-hospital delays.

Shortening the time from symptom to reperfusion and choosing the optimal reperfusion strategy are great challenges for patients suffering from STEMI (Zhang and Huo, 2011). The association between pre-hospital delay prior to deciding to go for acute coronary syndrome (ACS) and poor outcomes has been well documented (Ting *et al*., 2008; 2010; Smolderen *et al*., 2010). Studies have shown the associations of older age, female gender, and non-white race with longer pre-hospital delays (Goldberg *et al.*, 2002; Nguyen *et al.*, 2010). However, these factors are non-modifiable and likely account for only 10%–25% of pre-hospital delays (Ting *et al.*, 2010). Modifiable characteristics, such as patient education, medical insurance, income, and psychosocial factors are recognized in ACS (Dracup, 2009; Figueredo, 2009; Sullivan *et al.*, 2009).

Further understanding of the factors influencing decision time (from symptom onset to placing a call for medical help) may help target interventions more effectively and reduce pre-hospital delays. While demographic factors associated with these delays have been well described world-wide, scarce data are available for patients in China. Therefore, we assessed the factors that were associated with pre-hospital delay in patients with STEMI being admitted to the Emergency Department of the Second Affiliated Hospital, Wenzhou Medical University, China.

In this study, 74% of patients were male. The mean age was (65.68±12.68) years old. Most patients (77%) had no knowledge of heart infarction. The decision to call for medical help was made primarily by the patients themselves (70%). Most patients (89%) were covered by medical insurance. Patients were all married and predominantly well educated (Table 1). Most patients experienced pain symptoms, including chest pain, breathlessness, sweating, dizziness/ fainting as well as chest distress.

The median decision time was 1.17 h, ranging from 5 min to 30 d, with a mean delay of 23.58 h

‡ Corresponding authors
§ The two authors contributed equally to this work
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(±85.09 h). Patient decision time ≤60 min was observed in 50% of the patients. Most of the patients visited the hospital within 1 d after onset (Fig. 1).

Table 1 Characteristics of patients (*n*=100)

Parameter	Value*
Sociodemographic factors	
Men/women	74/26
Age (year)	65.68±12.68
Married	100 (100%)
Socioeconomic factors	
Educational status	
University qualification	4 (4%)
Middle school qualification	34 (34%)
Elementary school qualification	22 (22%)
No formal educational qualifications	40 (40%)
Source of knowledge	
Unawareness	77 (77%)
Medium	4 (4%)
Community education program	0 (0%)
Relatives	4 (4%)
Physicians	15 (15%)
Decision-maker	
Patient	70 (70%)
Bystander	30 (30%)
Household income (RMB/month)	
0	21 (21%)
<1000	36 (36%)
1000–5000	39 (39%)
5000–10000	3 (3%)
≥10000	1 (1%)
Living partner	
Yes	86 (86%)
No	14 (14%)
Medical insurance	
Yes	89 (89%)
No	11 (11%)
Residency	
Urban	42 (42%)
Suburban	58 (58%)
Cardiac history and risk factors	
Previous angina pectoris	24 (24%)
Diabetic	21 (21%)
Symptoms	
None	0 (0%)
Chest distress	11 (11%)
Chest pain and breathlessness	46 (46%)
Sweating or dizziness/fainting	43 (43%)

*Values are expressed as number (percent) or mean±standard deviation (SD)

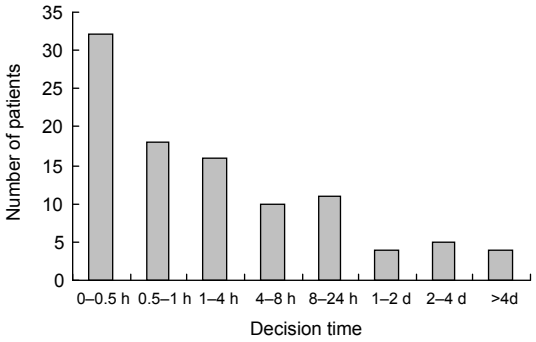

Fig. 1 Distribution of patients with different decision times

There were no associations between decision time and sociodemographic and socioeconomic factors apart from residency. Pre-hospital delay tended to be longer for patients living in suburban areas compared to those in urban areas (P=0.015) (Table 2). Shorter decision time was more likely among older patients (Fig. 2a). Medical insurance coverage, household income, bystander, knowledge of heart attack, disease history, gender, and level of educational qualification did not affect decision time. However, male patients tended to have longer decision time than female patients ((21.41±89.84) h vs. (21.23±71.39) h, P=0.871; Fig. 2b). Unexpectedly, patients having knowledge about heart attacks, tended to have a longer decision time than those not having any knowledge. This is similar to the tendency that patients with previous angina pectoris have longer decision time ((30.58±79.28) h vs. (21.37±87.23) h, P=0.646; Fig. 2c). Due to the small sample size and great variations of data, these differences did not reach statistical significance. Another important finding was that patients without medical insurance tended to have longer decision time than those with insurance ((68.15±216.22) h vs. (18.08±50.54) h, P=0.065; Fig. 2d). Nevertheless, these phenomena still deserve our further investigation.

The incidence of STEMI is increasing in China as the total elderly population increased during the past decades and the standards of living improves. It is well recognized that primary percutaneous coronary intervention (PCI) plays a central role in the treatment of STEMI (Eagle *et al.*, 2008; Gibson *et al.*, 2008). The American Heart Association/American College of Cardiology (AHA/ACC) guideline for STEMI recommends that PCI be performed within

90 min after onset as a class 1 recommendation and also recommends a total ischaemic time or door-to-balloon time of within 120 min (Antman *et al.*, 2004; 2008). The European Society of Cardiology (ESC) guideline for STEMI recommends PCI within 90 min of the onset of the symptom in patients presenting a low risk of bleeding and better prognosis (Shiomi *et al.*, 2012). Shorter symptom onset to balloon time is associated with better prognosis. In this study we evaluated the factors effecting symptom onset to decision time because the decision to door time is affected mainly by objective factors.

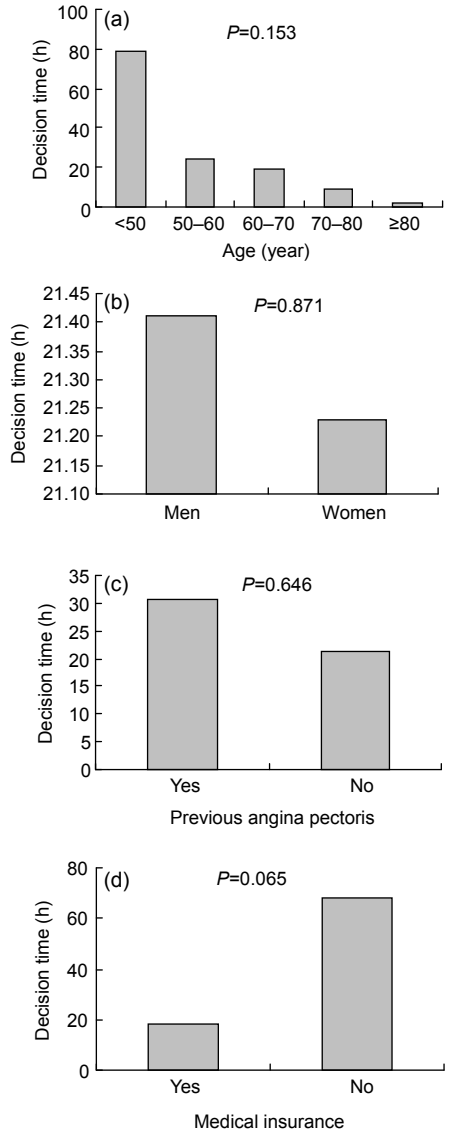

Fig. 2 Factors associated with decision time
(a) Age; (b) Gender; (c) Previous angina pectoris; (d) Medical insurance

Table 2 Predictors of short patient decision time (DT)

Parameter	Patient number*		P#
	DT ≤60 min	DT >60 min	
Sociodemographic factors			
Men/women	36 (72%)/ 14 (28%)	38 (76%)/ 12 (24%)	0.648
Age (year)			
<50	5 (10%)	10 (20%)	0.095
50–60	5 (10%)	10 (20%)	
60–70	17 (34%)	12 (24%)	
70–80	18 (36%)	14 (28%)	
≥80	5 (10%)	4 (8%)	
Married	50 (100%)	50 (100%)	
Socioeconomic factors			
Educational status			0.180
University	3 (6%)	1 (2%)	
Middle school	16 (32%)	18 (36%)	
Elementary school	10 (20%)	12 (24%)	
No formal educational	21 (42%)	19 (38%)	
Source of knowledge			0.239
Unawareness	41 (82%)	36 (72%)	
Medium	4 (8%)	0 (0%)	
Community education program	0 (0%)	0 (0%)	
Relatives	0 (0%)	4 (8%)	
Physicians	5 (10%)	10 (20%)	
Decision-maker			
Patient	38 (76%)	32 (64%)	0.190
Bystander	12 (24%)	18 (36%)	
Household income (RMB/month)			
0	12 (24%)	9 (18%)	0.657
<1000	17 (34%)	19 (38%)	
1000–5000	19 (38%)	20 (40%)	
5000–10000	1 (2%)	2 (4%)	
≥10000	1 (2%)	0 (0%)	
Living partner			
Yes	42 (84%)	44 (88%)	0.564
No	8 (16%)	6 (12%)	
Medical insurance			
Yes	45 (90%)	44 (88%)	0.749
No	5 (10%)	6 (12%)	
Residency			
Urban	27 (54%)	15 (30%)	0.015
Suburban	23 (46%)	35 (70%)	
Cardiac history and risk factors			
Previous angina pectoris	12 (24%)	12 (24%)	
Diabetic	9 (18%)	12 (24%)	0.461
Symptoms			
None	0 (0%)	0 (0%)	0.973
Chest distress	8 (16%)	3 (6%)	
Chest pain and breathlessness	19 (38%)	27 (54%)	
Sweating or dizziness/ fainting	23 (46%)	20 (40%)	

* Values are expressed as patient number (percent). # Comparison with χ^2 test

We found that only residency significantly affected onset to decision time in these patients. Surprisingly, a negative correlation was found between onset to decision time and their age. The elder patients arrived at the hospital more timely. This is in contrast to that reported by others, who found that older age was associated with longer pre-hospital delay (Goldberg *et al.*, 2002; Nguyen *et al.*, 2010). The percentage of diabetic patients with angina increased in older patients. Younger people may be too confident of their health status and ignore any chest symptoms. We should pay more attention to popularize STEMI knowledge among younger people.

The fact that most of the patients had no knowledge about heart infarction needs to be paid more attention to. This suggest that we should strengthen the primary prevention of STEMI and popularize the knowledge of STEMI through television, newspapers, internet, and radio stations with regard to precaution, treatment, and prognosis of STEMI.

This study had several limitations. Firstly, the sample size was small and was limited to Wenzhou city. Wenzhou is a coastal city and residents here have higher incomes than most cities in China. As shown in Table 1, most patients were well educated, and thus our results cannot represent the whole population in China. Secondly, we could not exclude the influences of patients' recall bias for symptom onset; especially with some patients visiting the hospital more than 10 d after the onset.

In conclusion, residency in urban area was associated with shorter decision time. More efforts should be paid to educate the at-risk population in suburban areas to effectively reduce pre-hospital delays.

Materials and methods

Study population

All patients admitted to the emergency department were transferred to the department of cardiology for further care. Inclusion criteria were patients with STEMI, ability to recall the time when symptoms started and time of calling for medical help, absence of comorbid conditions including renal failure, cancer, stroke, and infection, or inflammatory conditions that might influence the symptom presentation.

The diagnosis of STEMI was made if any two of the following were present: a history of characteristic chest pain lasting more than 30 min, development of new Q waves or the elevation of the ST-segment on the electrocardiogram, or an increase in the concentration of cardiac enzymes to the upper limit of normal (Antman *et al*., 2008).

Of the 283 patients recruited between Feb. 1, 2010 and June 14, 2012, we excluded 183 (65.7%) with incomplete data on symptom onset. After this exclusion, this analysis included 100 patients.

Main outcome measure

Onset-to-decision time was defined as the time between the STEMI symptom onset and making the decision to visit a hospital. Trained research staff used standardized questionnaires at the time of study enrollment.

Socioeconomic position was assessed using educational qualifications which were categorized into four groups: university qualification, middle school qualification, elementary school qualification, or no formal educational qualifications of any kind. The source of knowledge about the heart attack was categorized into four groups: unawareness, having some knowledge from various media (including newspaper, TV broadcasting, radio, and internet), community education programs, relatives or physicians. Decision-makers were categorized into two groups: patients or bystanders. The type of symptoms was categorized into three groups: chest distress, chest pain/breathlessness, and sweating/dizziness/fainting. Other factors included age, marital status, household income, residency, living partner, medical insurance, and diabetes mellitus.

Statistical analysis

The factors associated with decision time were analyzed by comparing the characteristics of patients with delays longer or shorter than 60 min. This criterion was selected because reperfusion therapy is most effective if initiated within the first hour. Groups were compared using χ^2 tests, and the factors were also analyzed by comparing the decision time using χ^2 tests. We also used multiple linear regression and logistic regression to estimate the effect of factors, including age, education, and income, on the decision time.

Compliance with ethics guidelines

Lu QIAN, Kang-ting JI, Jin-liang NAN, Qin LU, Yong-jin ZHU, Lu-ping WANG, Lian-ming LIAO, and Ji-fei TANG declare that they have no conflict of interest.

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000(5). Informed consent was obtained from all patients for being included in the study.

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