Pre-Hospital Delay in Patients With Acute Chest Pain

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Abstract

Introduction: Incidence of chest pain and discomfort varies in general population between 2 % and 5 %. Total prehospital delay involves two components: the time it takes for patients to recognise their symptoms as severe and seek medical attention, ie the decision-making time, and the time from seeking help to hospital admission, ie the transport time. Scope of the study was to analyse time loss in patients with chest pain hesitating to contact healthcare services, as well as distribution of acute myocardial infarction (AMI) and angina pectoris (AP) among them.

Methods: Retrospective analysis of medical records of physicians working at the emergency medical services (EMS) Department of the City of Belgrade, Serbia, from 20 April 2006 to 22 July 2013 on a total of 5,310 completed field interventions. When placing a call to the EMS, 10.43 % of patients cited chest pain as a major symptom. After deducting all those ones who denied having the symptom on examination thereafter and those for whom there were no data, 349 patients remained, ie 6.57 % of the total number of calls available for analysis.

Results: The average time between the onset of chest pain and the decision to call the EMS was 11.97 h, median 2 h and mode 1 h. Patient’s minimum prehospital delay was 2 min and the maximum was 20 days. Most patients who experienced chest pain or discomfort waited less than an hour before calling the EMS. Most commonly diagnoses made for a symptom of chest pain were AMI and AP, ie AMI with 12.32 % of the total diagnoses, as well as the elevated arterial pressure. There were more female patients, with no difference found among the age groups.

Conclusion: For the majority of patients with chest pain and discomfort presented in this paper the decision-making time was up to one hour, with cardiovascular causes being the at the top of the list.

Key words: Chest pain; Primary health care; Pre-hospital delay; Time, Emergency medical services; Pre-hospital.

Introduction

Chest pain is a common problem and up to 25 % of the general population experience it during their lifetime.1 Non-traumatic chest pain is a common symptom in clinical practice and is one of the most commonly reported complaints of patients in emergency medical services with a prevalence of 2–6 %.2,4 Numerous aetiological factors can cause chest pain, from life-threatening conditions to others that do not represent an immediate threat to patients’ lives. Causes of chest pain may be of cardiovascular, pulmonary, neurological, gastrointestinal, musculoskeletal or psychiatric origin.2,5

Although most patients with chest pain have other non-life-threatening conditions, in approximately 10-20 % of cases, patients suffer from the acute coronary syndrome (ACS) requiring early intervention and treatment.3,6 The most serious and common causes of chest pain are ACS, aor-
tic dissection, pulmonary embolism, rupture of an aortic aneurysm and tension pneumothorax. Many factors, including demographics, as well as clinical and social components, are responsible for the delay in patient’s decision making process to seek immediate medical attention. Numerical studies indicate that it is very difficult for patients to recognise whether chest pain is of cardiac or non-cardiac origin. Early referral of possible acute myocardial infarction (AMI) to hospitals is crucial for survival and subsequent quality of life. Various studies have been conducted on prehospital delay in patients with chest pain. Observational studies indicate that a number of factors may be associated with patients’ delay in seeking medical attention for non-traumatic chest pain. These factors include: demographics (gender, age, race), clinical (history of chronic illnesses and previous myocardial infarction) and social factors (neighbour/layman advice, occurrence outside of home, living alone, resting or sleeping during a cardiac event, feeling embarrassed). Pain intensity may not be a significant factor in the diagnosis of AMI.

Total prehospital delay involves two components: the time it takes for patients to recognise their symptoms as severe and seek medical attention, ie the decision-making time, and the time from seeking help to hospital admission, ie the transport time. Research indicates that the time elapsed while patients are making a decision whether to seek medical attention is a larger component and strategies for reducing the patient delays must target exactly this component. The recommendations of the American Heart Association are that “patients who have been experiencing symptoms of myocardial infarction for 5-10 minutes should seek immediate medical attention”. “Early administration of thrombolytic therapy reduces infarct size and improves survival. Its administration within one hour of symptom onset reduces mortality by 45% and by 23% if administered within 3 h”.

In the EMS Department of the City of Belgrade a medical doctor is a compulsory member of each EMS team and each ambulance is equipped with an electrocardiograph machine (ECG) and the equipment for cardiopulmonary resuscitation. Scope of the study was analysis of patients’ decision-making time since the onset of chest pain until they make a call to the EMS, evaluation of diagnoses made by the ambulance team and analysis of patients diagnosed with acute coronary syndrome (ACS).

**Methods**

The study is a retrospective analysis of medical records of physicians working at the EMS Department, Belgrade, Serbia on completed field interventions, from 20 April 2006 to 22 July 2013. Data were taken from the physician’s call form completed for each attended patient and was then entered into an Excel database, which was then searched and sorted. Patient’s age, gender, duration of symptoms, previous medical history, as well as prescribed therapy were recorded, without the identification data such as patient’s name and address. Included in the study were those patients whose main complaint was pain or other discomfort suggestive of chest pain at the moment when their call was taken by the EMS call centre. Out of the total number, patients that denied on examination they were experiencing any chest pain were excluded. There were some patients for whom this information was not entered and therefore they were excluded from the study as well. There were 349 patients with complaint of chest pain as their main symptom, for which they were able to provide accurate information about when the problems had started.

In the study group the time elapsed from the onset of chest pain to the time they made a call to the EMS, Belgrade was analysed. Times were calculated based on patients’ explanations about when exactly the chest pain had started. For ease of interpretation, depending on the duration of the complaint until they made a call to EMS, patients were divided into groups: ≤ 1 h, 1-2 h, 2-24 h and > 24 h.

The diagnosis of AMI was made based on medical history taken during examination, ECG records and other medical records available from patients. Diagnosis of newly present angina pectoris (AP) was made in patients, as well as prolonged AP and angina with altered character of complaints. In patients with AMI and AP, the gender difference in calling EMS was analysed. Those patients were divided into groups based on the time elapsed from the onset of pain until calling for an ambulance: ≤ 1 h, 1-2 h, 2-24 h and
> 24 h. All patients underwent a medical examination and ECG testing.

The data were processed using IBM SPSS 21.0 software. Results are presented as mean ± standard deviation (SD) and median or mode. Statistical testing was done with the Chi-square test and descriptive statistics. The diagnoses in this study represent working, not definitive diagnoses.

Results

Of the 5,310 interventions, a total of 554 calls received by the call centre were with major complaint of chest pain, which accounted for 10.43 % of all interventions. There were 349 patients with complaint of chest pain as their main problem, for which they were able to provide accurate information about when the problems had started, which makes 6.57 % of the total number of calls that were included in the analysis.

Gender and age structure are presented in Table 1. When comparing younger and older patients (up to 65 years and ≥ 65), there were no statistical significance ($\chi^2 = 0.84, p > 0.05$), as well as by gender ($\chi^2 = 0.84, p > 0.05$). When comparing older and younger age representation in the female patient group, there were statistically significantly more elderly patients ($\chi^2 = 9.97, p < 0.01$). When comparing younger and older male patients, there was no statistically significant difference ($\chi^2 = 0.44, p > 0.05$).

The average time between the onset of chest pain and the decision to call an ambulance was 11.97 h (range 2 min – 20 days), median 2 h and mode 1 h. Older patients waited longer to make the call to EMS. There was no statistically significant gender difference in all the groups based on duration of chest pain before calling the EMS ($p > 0.05$) (Table 2).

ACS, ie AMI and AP, accounted for 45 % (n = 157) of all diagnoses (Table 3). Non-cardiovascular diseases accounted for 31.5 %, with severe pain and muscle cramps. Other cardiovascular diseases that were the cause of or were interpreted by patients as chest pain accounted for 23.52 % (n = 82) of cases. In this category increased blood pressure was most common with 10.89 % of cases. Duration of chest pain before calling EMS based on diagnosis is shown in Table 4.

The average time from the onset of chest pain to making a call to the EMS for patients with ACS, was 7.6 h, median 0.5 h. The average time for AMI, was 6.3 h (median 0.5 h) and for AP 7.6 h (median 0.5 h). The majority of these patients (43.55 %, n = 152) were in the group who had waited up to one day.

ACS is more likely to be confused with other diseases. Table 3 presents the percentage of diagnoses made by the call centre and the percentage of cases in which the diagnosis was verified by medical examination or ECG testing. The diagnoses in this study represent working, not definitive diagnoses.

### Table 1: Gender and age distribution of patients with chest pain

| Gender   | N   | %    | Age ≤ 65 | Age > 65 | Total | Range | Mean ± SD |
|----------|-----|------|----------|----------|-------|--------|-----------|
| Male     | 147 | 42.12| 77       | 69       | 146   | 25-95  | 62 ± 14   |
| Female   | 196 | 56.16| 76       | 119      | 195   | 32-88  | 67 ± 12   |
| Unknown* | 3±3 | 1.72 | 6±2      | 8        | 8     |         |           |
| Total    | 349 | 100  | 153      | 188      | 349   | 25-95  | 64.53 ± 13.19 |

N = number of patients; % = percentage of patients
* For 3 patients there were no gender data, for 2 patients there were no age data and for 3 patients there were neither age nor gender data.

### Table 2: Duration of chest pain before calling Emergency Medical Service Belgrade with gender and age distribution

| Time      | N   | %    | Gender       | Age       |
|-----------|-----|------|--------------|-----------|
|           |     |      | Female (N) % | Male (N) %| Mean ± SD |
| Up to 1h  | 152 | 43.55| 74           | 74        | 50.34    | 61.89 ± 13.09 |
| 1-2 h     | 47  | 13.47| 29           | 14.8      | 17       | 11.56    | 64.50 ± 10.30 |
| 2 - 24 h  | 117 | 33.52| 72           | 36.73     | 45       | 30.61    | 67.25 ± 13.21 |
| Over 24 h | 33  | 9.46 | 21           | 10.71     | 11       | 7.49     | 67.45 ± 15.16 |

Total: 349 100 147 100 64.53 ± 13.19

N = number of patients; % = percentage of patients

**For 3 patients there were no gender data, for 2 patients there is no age data and for 3 patients there were neither age nor gender data.

### Table 3: Causes of chest pain based on diagnoses made by the emergency medicine service team in the field

| Diagnosis                          | N   | %    |
|------------------------------------|-----|------|
| Acute coronary syndrome            | 157 | 45   |
| Acute myocardial infarction         | 43  | 12.32|
| Angina pectoris                     | 114 | 32.66|
| Other Cardiovascular Diseases      | 82  | 23.5 |
| Hypertension                       | 38  | 10.89|
| Rhythm disorders                   | 30  | 8.6  |
| Heart failure                      | 12  | 3.44 |
| Cardiac arrest with successful resuscitation | 1 | 0.29 |
| Sudden death due to cardiac arrest | 1   | 0.29 |
| Total                              | 110 | 31.52|

### Table 4: Causes of chest pain based on diagnosis made by the emergency medicine service team in the field

| Diagnosis                          | N   | %    |
|------------------------------------|-----|------|
| Severe pain and spasm              | 45  | 12.89|
| Abdominal and pelvic pain          | 10  | 2.87 |
| Throat and chest pain              | 12  | 3.44 |
| Instability and dizziness          | 2   | 0.57 |
| Syncope and collapse               | 9   | 2.58 |
| Nausea and vomiting                | 2   | 0.57 |
| Respiratory system*                | 12  | 3.44 |
| Other**                            | 18  | 5.16 |
| Total                              | 349 | 100  |

N = number of patients; % = percentage of patients
* Respiratory system (cold, respiratory failure, chronic obstructive pulmonary disease, chronic bronchitis, pneumonia, shortness of breath)
** Other: 203, unstable joint, cystic warty hernia, mental or behavioural disorders caused by alcohol use, gallbladder stone without gallbladder inflammation, fever of unknown origin, apoplexy, severe stress reaction, joint inflammation.
hour from the onset of chest pain before calling for an ambulance. The average decision time was significantly shorter when a patient with AMI who sought help after 24 h from the onset of chest pain was excluded and the average time was then 2.02 h.

### Table 4: Distribution of pre-hospital delays in patients with chest pain based on the diagnosis

| Time          | AMI | AP | Other CVD | Non-CVD | Total (N) |
|---------------|-----|----|-----------|---------|-----------|
| Up to 1 h     | 27  | 57 | (37.50)   | 24 (15.79) | 44 (28.95) | 152       |
| 1-2 h         | 3   | 16 | (34.04)   | 13 (27.66) | 15 (31.91) | 47        |
| 2 h to 24 h   | 12  | 34 | (29.06)   | 32 (27.66) | 39 (33.33) | 117       |
| Over 24 h     | 1   | 7  | (21.21)   | 13 (39.39) | 12 (36.36) | 33        |
| Total         | 43  | 114| (32.49)   | 82 (23.49) | 110 (31.52) | 349       |

N = number of patients, % = percentage of patients
AMI = acute myocardial infarction, AP = angina pectoris
Other CVD = cardiovascular diseases with the exception of AMI and AP, Non-CV = non-cardiovascular causes of chest pain

### Table 5: Gender and age distribution in patients with acute myocardial infarction and angina pectoris

| Gender | ACS | AMI | AP |
|--------|-----|-----|----|
| Male   | 79  | 27  | 52 |
| < 65 years | 41  | 14  | 27 |
| ≥ 65 years | 37  | 12  | 25 |
| Female | 74  | 16  | 58 |
| < 65 years | 74  | 16  | 11 |
| ≥ 65 years | 27  | 5   | 22 |
| Unknown | 5   | 1   | 4  |
| Total   | 157 | 43  | 114|

N = number of patients, % = percentage of patients
ACS = acute coronary syndrome, AMI = acute myocardial infarction, AP = angina pectoris
For three patients there were no data on their gender, for two patients there were no data on their age and for three patients there were no data on either gender or age

Considering ACS, there was no statistical difference between genders and age (p > 0.05), except for AMI where there was greater number of females over 65 years of age compared to those under 65 (χ² = 5.83, p < 0.05) (Table 5). Male patients with AMI were younger, but the difference was not statistically significant. A higher percentage of men who complained of chest pain had AMI in comparison to females (62.8 % vs 37.2 %), however no statistical significance was found.

### Discussion

In this study, every tenth patient who called an EMS complained of chest pain. However, when those interventions in which chest pain was quoted as reason for calling the EMS were excluded from this study and patients denying such a complaint later on the scene, then the remaining result was 8.44 %, which is still higher than in the prevalence of chest pain in the emergency services of Pretoria, South Africa.¹

“Recent studies examining the differences in the proportion of males and females with AMI who call for an ambulance have found inconsistent results. While some studies have found that there is no difference between males and females with AMI when calling for EMS, other studies targeting patients with AMI have found that women are more likely to call for emergency medical services than men”.¹⁹ In this study, almost equal percentages of males and females called the EMS and when it comes to aggregate AMI and AP diagnoses, with no statistical significance. When comparing females older and younger than 65 years of age, the incidence of females over 65 was higher, although the comparison number was relatively small.

The average time between the onset of chest pain and the decision to call for an ambulance in this study was 11.97 h, with a median of two hours, which is longer than the study by Kathleen et al¹⁶ where this time was 9.14 h, median 1.90 h. The largest number of patients with chest pain in this study (n = 152 or 43.55 %) were in the group in which the time interval between the onset of chest pain and placing a call to the EMS was ≤ 1 h. These data differ significantly from the study conducted in Belgium by Van Severen et al,¹⁰ where only 9 % of patients were in the group where the time between the onset of chest pain and hospitalisation was < 1 h. According to their results, the largest number of patients, ie 32 %, arrived at the hospital after 3-12 h since the onset of the complaint, whereas in this study, 33.5 % or 117 patients, decided in the time interval of 2-24 h from the onset of pain to call the EMS.¹⁰ The largest number of patients with chest pain in the present study was in the group who waited up to one hour to make a call the EMS and the lowest percentage of patients (9.45 %) decided to call the EMS in the time interval of 24-48 h after the onset of symptoms. There were 9.45 % of patients in the group that waited ≥ 24 h. In this group, there was also one patient who stated that his pain had been lasting all the time.

Numerous observational studies indicate a significant time delay in deciding to call for an ambulance from the onset of chest pain. Mumford et al¹⁸ received an average waiting time of 172 minutes for their patients with AMI, and 25 % of
Most delays in seeking appropriate treatment occur prior to patients’ contact with medical services. Although the majority of patients in this study were in the group who had waited up to one hour from the onset of chest pain before calling for an ambulance, the average time was still unsatisfactory. Strategies for reducing the patient delays must target exactly this component, ie reducing the time in which patients decide to seek medical attention.

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Conflict of interest
None.

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