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EC EMERGENCY MEDICINE AND CRITICAL CARE
Research Article

Pre-Hospital Acute Chest Pain Interventions: Factors Influencing Departure Time Limit

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Received: July 17, 2021; **Published:** August 28, 2021

Abstract

Background: Primary interventions of Emergency and Resuscitation Mobile Services (ERMS) for acute chest pain (ACP) may represent both diagnostic and therapeutic challenges for the healthcare team members. Reducing different treatment times is essential in order to improve prognosis specially when ACP is related to cardiovascular emergencies.

Aim of the Study: The aim of our study was to identify factors influencing departure time limit when managing patients with ACP in pre-hospital settings.

Methods: We conducted a retrospective descriptive study at Ben Arous ERMS over a one-year period. We included pre-hospital primary interventions involving patients with ACP. Demographic and clinical data, time frames and performed procedures were collected. We have considered one judgment criteria: departure time limit. Both univariate and multivariate analysis were performed in order to identify departure time limit delay-influencing-factors.

Results: We included 86 interventions performed on 41 patients (48%) whose age was over 60 years. Male were predominant (73%). Sixty patients (70%) had cardiovascular risk factors. The median departure time limit was 10 minutes [5-15]. Multivariate analysis has found two factors influencing independently time to departure (adjusted Odds ration; p value): home intervention (1.8; 0.022) and the presence of a junior intervention physician (2; 0.007).

Conclusion: Factors influencing ERMS departure time limit when managing patients with ACP are logistical. Medical training and skills maintenance are crucial to improve the performance of multi-skilled ERMS teams.

Keywords: *Emergency and Resuscitation Mobile Services (ERMS); Acute Chest Pain (ACP)*

Introduction

Acute chest pain (ACP) is a symptom commonly experienced by patients with cardio-vascular risk factors. CP causes are very diverse. The difficulties in management are linked to the lack of parallelism between the extent of the pain and the severity of the underlying disease, as well as the variety of intra- and extra-thoracic etiologies [1].

CP is involved in the three fields of emergency medicine: regulation centers, Emergency and Resuscitation Mobile Services (ERMS) and emergency departments. It is also the most frequent chief complaint of emergency visits [1].

According to a Danish study [2], pre-hospital management of CP represented 16.4% of ERMS teams interventions, while Ngyyen., *et al*. Swedish study [3] had noticed an increase in ERMS CP interventions from 24% to 39% between 1986 and 2008.

The effective management of CP is directly linked to time: the earlier the treatment, the greater the survival, according to the dogma "Time is myocardium".

There are two types of delay: pre-hospital delay and hospital delay. Together, they affect the time to administer the appropriate treatments.

Evanson., *et al*. [4] reviewed different pre-hospital and intra-hospital delays in the management of CP patients. This study showed that the pre-hospital duration from the onset of symptoms to hospital arrival represented the longest delay.

Thus, approximately half of the deaths attributed to acute coronary syndromes (ACS) occur as a result of cardiac arrest in an out-of-hospital setting. This reinforces the importance of early activation of ERMS in case of patients with signs and symptoms supporting an urgent condition [5].

Long pre-hospital delays have been associated with poorer results and were a management problem reported by several teams [4].

In order to explain disparities, we focused on departure time when managing pre-hospital patients with ACP.

Aim of the Study

The aim of our study was to identify factors influencing ERMS time to departure in acute CP interventions.

Methods

Study population

We conducted a retrospective study over a one year period (August 2019 to July 2020) at Ben Arous ERMS. We included pre-hospital primary interventions involving patients aged more than 18 years experiencing ACP and who called the 190 (national call-center).

Data collection

Data was collected as following: personal data, medical history and treatment, comorbidities and cardiovascular risk factors, CP characteristics, time to departure, physical examination characteristics and pre-hospital treatment.

Group comparison

Patients were divided into two groups in order to identify factors predicting long departure time.

A departure time was considered “long” when it exceeds ten minutes.

- Group A: Interventions with long departure time.
- Group B: Interventions with short departure time.

Statistical analysis

We used SPSS, version 20.0 (IBM SPSS Inc, Chicago, Illinois, USA) for data analysis. The Kolmogorov-Smirnov test was used for variables distribution. Categorical values were assessed using a chi-square test (or Fisher’s exact test when indicated) and continuous variables using a Student T test or Mann-Whitney test for trends in the absence of a normal distribution. Univariate analysis of baseline variables was performed by using a backward stepwise variable selection procedure to determine the predictive factors of long time to departure in patients presenting with ACP. To find independent predictors of long time to departure, multivariate analysis was performed with logistic regression by backward stepwise elimination. The odds ratio (OR) was expressed with the respective 95% confidence interval (CI).

In all tests, a p value less than 0.05 was significant.

Results

Baseline characteristics

During the study period, there were 1830 interventions operated by the Ben Arous ERMS. There were 113 eligible interventions for inclusion. However, 27 interventions were excluded because of lacking data (Figure 1).

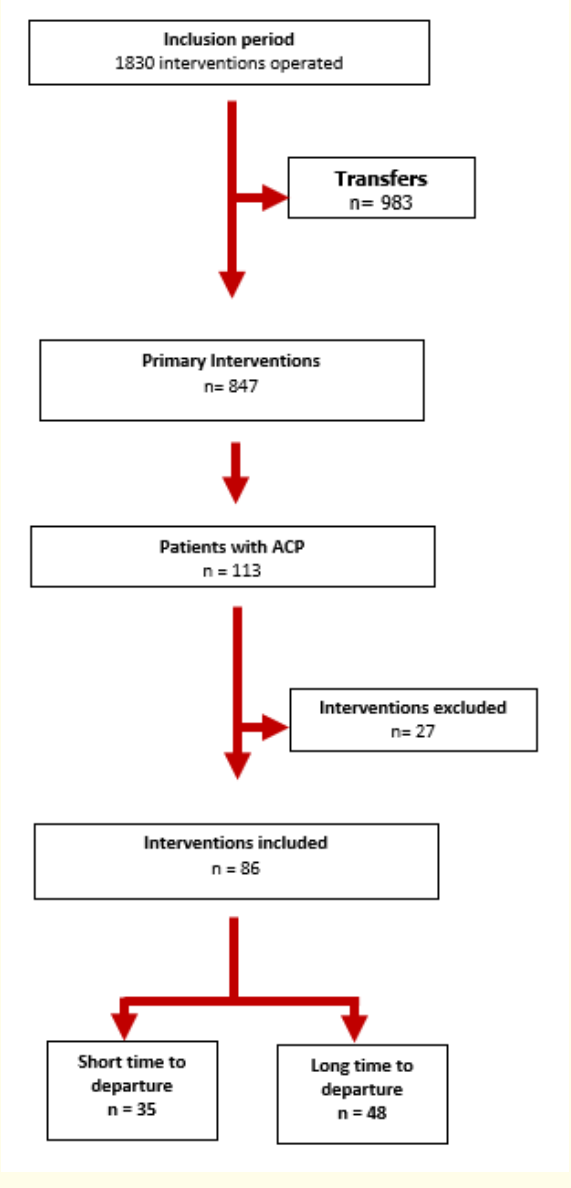

Figure 1: *Inclusion algorithm.*

Mean age of the 86 transported patients was 59 ± 17 ans. Forty eight percents (n = 41) were aged more than 60 years. Males were predominant with sex-ratio = 3. Sixty patients (70%) had at least one cardiovascular risk factor. Seventy-one intervention (61%) were carried out at the patient's home. A predominance of interventions by junior physicians was found: 67 interventions (78%).

Median time to departure was 10 [5-15] minutes. Median duration of medicalization was 45 [36-60] minutes. The initial ECG showed ST segment elevation in 19 patients (22%).

Table 1 is showing the comparison between groups.

	Group A n = 48	Group B n = 35	P
Mean age ± SD	57 ± 17	61 ± 17	0,3
Male n (%)	36 (75)	27 (77)	0,5
Comorbidities			
Diabetes n (%)	13 (27)	9 (26)	0,5
Hypertension n (%)	8 (9)	7 (8)	0,6
Coronary artery disease n (%)	12 (25)	7 (20)	0,35
Tabac n (%)	12 (25)	12 (34)	0,28
Regulator doctor			
University hospital doctor	7 (15)	7 (20)	0,35
Seniority > 5 years n (%)	47 (98)	35 (100)	0,07
Call maker			
Familly member	39 (81)	22 (63)	0,061
Intervention doctor			
Non-tenured physicians n (%)	39 (81)	19 (54)	0,008
Seniority ± SD	6 ± 2,6	4,7 ± 1,9	0,018
Seniority < 5 years n (%)	40 (83)	20 (57)	0,008
Nurse			
Emergency technician n (%)	29 (60)	20 (57)	0,05
Seniority > 5 years n (%)	28 (58)	17 (49)	0,14
Paramedic			
Senority > 5 years n (%)	24 (50)	16 (48)	0,24

Table 1: *Comparison of groups.*
SD: Standard Deviation.

Predictor of long time to departure

In univariate analysis, five predictors were found to have significant association with long time to departure in patients managed by Ben Arous ERMS with ACP.

Multivariate analysis identified two independent predictors of long time to departure (adjusted OR; (95%CI); p): intervention carried out at patient's house (1,8; [1,091 - 3,048]; 0,022), non-tenured physicians (2, [1,218 - 3,417], 0.007) (Table 2).

Factor	Adjusted OR	[95% CI]	p
Intervention carried out at patient's house	1,8	[1,091 - 3,048]	0,022
Junior physicians	2	[1,218 - 3,417]	0,007

Table 2: *Factors independently associated with long time to departure.*
**OR: Odds-Ratio; CI: Confidence Interval.*

Discussion

We studied a specific group of patients: those having acute chest pain managed by the Ben Arous ERMS. CP is a clinical condition for which delays in seeking care can have significant and adverse consequences on patient outcomes. Morbidity and mortality can be reduced considerably if individuals receive treatment soon after the onset of symptoms. Patient survival is significantly higher when treatment is initiated within the first few hours after symptom onset, but few patients reach hospital quickly [9].

In our ERMS, we found that the intervention is carried out at patient's house and the non-tenured physicians are the factors predicting a long time to departure.

The review of the literature identified several predictors of a longer time to departure: female gender, several cardiovascular risk factors, age over 80 [10,11].

In Western countries, the median time to symptom onset upon arrival at hospital was two and a half hours (two hours for ST-segment elevation myocardial infarction (STEMI), three hours for non-ST segment elevation myocardial infarction (NSTEMI)) and approximately 10% of patients would arrive at the hospital 12 hours after the onset of symptoms [6].

Golden., *et al*. [7] trial treating the predictive factors of a delay in the prehospital care of CP, objected that the prehospital delays measured by the exceeding of the total transport time of the recommendations were influenced by the season, the age of the patient and the transport to a specialized hospital center.

Dubujet., *et al*. [8] trial founds that on Friday, the type of patient and the operating physician were factors directly influencing the time to departure.

According to Lukas., *et al*. [12] study, carried out on 380 patients treated by ERMSs in the south of the department of Isère, the call time increased with age ($p < 0.01$).

Mohan., *et al*. [13] study, carried out on 619 patients treated for STEMI, its results matched those of Lukas., *et al*. with significantly longer delays in the elderly ($p = 0.01$).

In the Concannon., *et al*. [14] study, women were more likely to have longer time to departure due to the high prevalence of atypical CP in this subgroup; source of confusion and diagnostic delay by healthcare teams.

Thus, inappropriate delays may occur because there is less certainty of heart damage. More time is wasted in diagnosing the pathology by the medical regulatory team and therefore by the ERMS team.

In the Coventry., *et al*. [15] study, the results showed that if the patient was at home and if the caller was someone other than the spouse, there was an increased delay (OR = 2.6; $p < 0.001$). It was also found that if a healthcare professional made the phone call to the ERMS from the patient's home, there was an increased delay (OR = 3; $p < 0.001$).

We have identified the predictive factors of long time to departure of acute chest pain. These factors could be incorporated into a tool to help emergency physician to dispatch ambulances. Training intervention physicians (especially the youngest) but also the paramedical team of the importance of reducing delays in CP. Optimal teamwork is the only guarantee for the success of each intervention.

Study Limitation

Our study has some limitations. First, the mono center site of the study reduces the number of cases included: multicenter protocol may increase the number of patients to better identify factors associated with long time to departure. Second, the retrospective nature of the study had recorded missing data concerning the time component and therefore the evaluation of the time limits was biased.

Conclusion

Non-traumatic CP is and will remain a frequent reason for resorting to prehospital emergency medicine. For medical regulation, it remains a complex symptom to be analyzed during a telephone interview and the presentation may be different for the same etiological diagnosis. The most precise collection as possible of anamnestic and semiological data is essential to establish a probabilistic clinical reasoning and to construct the etiological diagnosis which continues to be a challenge for the health system. The interest in algorithms, scores and checklists remain relevant. No one can do without them these days. Technological advances make it possible to minimize calculation and reasoning times using applications designed for this purpose.

Conflict of Interest

The authors declare that no conflicts of interest exist.

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Volume 5 Issue 9 September 2021