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RESEARCH ARTICLE (ORIGINAL)

Out-of-hospital response of the immediate life support ambulance nurse to patients with acute chest pain

Resposta pré-hospitalar do enfermeiro da ambulância suporte imediato de vida à pessoa com dor torácica aguda

Respuesta prehospitalaria del enfermero de la ambulancia de soporte vital inmediato a la persona con dolor torácico agudo

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Abstract
Background: Acute chest pain (ACP) is a common symptom in patients with acute coronary syndrome (ACS) that often requires emergency care.
Objective: Examine the out-of-hospital response time and the role of immediate life support nurses in the presence of ACP in patients with suspected ACS, in two districts in the interior north of Portugal.
Methodology: Observational, analytical, cross-sectional, retrospective, quantitative study with a sample of 75 occurrences.
Results: Total out-of-hospital response times were high, exceeding 95 minutes in both districts. In ST-elevation myocardial infarction (STEMI), total mean times were 131 ± 22.23 minutes, which occurred in 10.66% of the total sample. The nurses used the chest pain protocol in the majority of occurrences (98.7%), performed electrocardiogram (97.3%), and contributed to symptom improvement (72%).
Conclusion: Although the nurse's role is crucial for establishing the diagnosis and managing symptoms, the response times, especially in STEMI cases, exceed the recommended time for the procedure of choice (angioplasty).

Keywords: cardiovascular diseases; chest pain; emergency nursing; ambulances; emergency medical services

Resumo
Enquadramento: A dor torácica aguda (DTA) é um sintoma comum na pessoa com síndrome coronária aguda (SCA) que requer frequentemente cuidados de emergência.
Objetivo: Conhecer o tempo de resposta pré-hospitalar e a atuação do enfermeiro da ambulância suporte imediato de vida nas ocorrências de DTA, na pessoa com suspeita de SCA, relativamente a dois distritos do interior norte de Portugal.
Metodologia: Estudo observacional, analítico transversal, retrospetivo, de cariz quantitativo, numa amostra de 75 ocorrências.
Resultados: Verificaram-se tempos totais longos na resposta pré-hospitalar, ultrapassando os 95 minutos em ambos os distritos e, no enfarte agudo miocárdio com elevação do segmento ST (EAMCSST), apresentando tempos médios de 131 ± 22,23 minutos, sucedido em 10,66% da amostra total. Os enfermeiros utilizaram o protocolo da dor torácica na generalidade das ocorrências (98,7%), realizaram eletrocardiograma (97,3%) e contribuíram para a melhoria dos sintomas (72%).
Conclusão: O enfermeiro é essencial no diagnóstico e controlo da sintomatologia, mas os tempos de resposta, particularmente no EAMCSST, ultrapassam o recomendado para a realização do procedimento de eleição, a angioplastia.

Palavras-chave: doenças cardiovasculares; dor no peito; enfermagem em emergência; ambulâncias; atendimento de emergência pré-hospitalar

Resumen
Marco contextual: El dolor torácico agudo (DTA) es un síntoma frecuente en las personas con síndrome coronario agudo (SCA) que a menudo requiere atención de urgencias.
Objetivo: Conocer el tiempo de respuesta prehospitalaria y el papel del enfermero de la ambulancia de soporte vital inmediato en casos de DTA en personas con posible SCA en dos distritos del norte de Portugal.
Metodología: Estudio observacional, analítico, transversal, retrospectivo, cuantitativo, con una muestra de 75 casos.
Resultados: Se registraron tiempos totales de respuesta prehospitalaria largos, superiores a 95 minutos en ambos distritos, y en infarto agudo de miocardio con elevación del segmento ST (EAMCSST), con tiempos medios de 131 ± 22,23 minutos, seguido del 10,66% de la muestra total. Los enfermeros utilizaron el protocolo de dolor torácico en la mayoría de los casos (98,7%), realizaron electrocardiogramas (97,3%) y contribuyeron a la mejoría de los síntomas (72%).
Conclusión: El enfermero es fundamental para diagnosticar y controlar los síntomas, pero los tiempos de respuesta, sobre todo en el IAMCEST, superan los recomendados para el procedimiento de elección, la angioplastia.

Palabras clave: enfermedades cardiovasculares; dolor en el pecho; enfermería de urgencias; ambulancias; atención prehospitalaria de urgencia

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Introduction

Cardiovascular diseases are responsible for approximately one-third of all deaths worldwide (Bueno, 2019). In Europe, cardiovascular diseases cause 3.9 million deaths each year, accounting for 45% of all deaths (Instituto Nacional de Emergência Médica [INEM], 2020). In Portugal, they account for 29.9% of deaths, with 7,151 deaths caused by ischemic heart disease, including the acute coronary syndrome (ACS). Acute chest pain (ACP) is one of the most common reasons for seeking emergency care worldwide and the most common symptom found in ACS (Bonaca & Sabatine, 2022). Acute myocardial infarction (AMI) is a type of ACS that accounts for 3.8% of the total number of deaths in Portugal and almost 60% of deaths from ischemic heart disease (INE, 2021). The immediate life support (ILS) ambulance nurse plays a key role in the rapid diagnosis, hemodynamic stabilization, arrhythmia control, and administration of therapy that are essential to the survival of patients with ACS. This study aims to examine the out-of-hospital response time and the role of the ILS ambulance nurse in the presence of ACP in patients with suspected ACS, in two districts in the interior north of Portugal.

Background

ACS is a term used to describe a range of conditions that occur after an imbalance between the supply of oxygen to the myocardium and its metabolic needs (Bonaca & Sabatine, 2022). The failure to deliver oxygenated blood occurs due to total or partial vessel occlusion, which is most often caused by atherosclerosis (Paiva et al., 2020). The degree of arterial obstruction influences the intensity of the ischemia, the type of ACS, and its severity. Angina is the most common symptom of ischemia. It is characterized by pain, discomfort, or tightness in the chest, and is present in 80% of ACS cases (Carvalho et al., 2022). Given that chest pain is the main symptom in suspected ACS, an electrocardiogram (ECG) is the procedure of choice (Collet et al., 2020). If the ECG is performed within the first 10 minutes, ACS can be divided into two types: non-ST-elevation ACS (NSTE-ACS) and ST-elevation ACS (STE-ACS). NSTE-ACS is found in approximately 60% of ACS cases and is subdivided into two types: unstable angina (UA) and non-ST-elevation myocardial infarction (NSTEMI; Fernandes et al., 2020). Both types exhibit identical pathophysiology, and the differential diagnosis is subject to cardiac biomarkers, with only elevation in NSTE-ACS. Treatment is adjusted based on severity, the potential to cause injury, and clinical manifestations (Ibanez & Halvorsen, 2019). ST-elevation myocardial infarction (STEMI) reflects an evolving myocardial injury (INEM, 2020), with sudden onset chest pain at rest, lasting more than 20 minutes, that does not respond to the administration of nitrates (Meira et al., 2021). Chest pain can be limited to the chest or radiate to the left upper limb, back, or jaw. It can be accompanied by intense diaphoresis, dyspnea, nausea/vomiting, palpitations, and syncope, with a high risk of arrhythmias such as ventricular tachycardia and ventricular fibrillation (INEM, 2020). Pain characterization is essential and the study by Ferreira-Valente et al. (2011) supports the validity of the Numerical Rating Scale for use in Portuguese samples. The presence of cardiovascular risk factors substantially increases the risk of AMI. These risk factors can be divided into two categories: non-modifiable (gender, age, genetic heritage, and race) and modifiable (biological factors such as hypertension, diabetes mellitus [DM], dyslipidemia, and obesity). The latter are closely linked to an excessive lifestyle (Meira et al., 2021). In Portugal, Bourbon et al. (2019) found that 68% of individuals had two or more risk factors, while 22% had four or more, namely obesity, hypertension, and dyslipidemia. Out-of-hospital ECG reduces diagnosis time and facilitates treatment decisions (Bonaca & Sabatine, 2022). Using telemedicine, the regulatory physician analyzes the ECG remotely and validates the protocol actions of the ILS ambulance nurse. This initial treatment aims to reduce symptoms by resting the victim, relieving pain and anxiety to reduce the adrenergic mechanism, the cardiac effort, and the extent of necrosis (Carvalho et al., 2022). The therapeutic strategy is influenced by the time of symptom onset, the health status and history of the patient with ACP, the severity of the disease, and the time/distance to treatment (Bohula & Morrow, 2022). Primary percutaneous coronary intervention (PPCI), also known as angioplasty, is the recommended treatment for patients with STEMI. It restores blood flow to the myocardium if performed within 120 minutes. A stent is placed to maintain artery patency in the long term, with a low risk of bleeding and visual evidence of the lumen returning to normal (INEM, 2020). If it cannot be done within this timeframe, fibrinolysis is recommended within the first 10 minutes, after risk assessment, particularly in long distance transport (> 60 minutes). Thrombolysis restores blood flow to the myocardium, preventing approximately 30 early deaths in 1,000 patients (Ibanez & Halvorsen, 2019). The fast-acting protocol (*Via Verde Coronária*, VVC), activated early by the Urgent Patients Coordination Center (*Centro de Orientação de Doentes Urgentes*, CODU), is crucial for the referral and optimization of ACS treatment, particularly in patients with STEMI, by reducing the delay in myocardial revascularization (Camacho et al. 2023).

In Portugal, the team of ILS ambulances consists of a nurse and an out-of-hospital emergency technician who use protocols based on the best available evidence. A working group was created to review them (Despacho n.º 4163/2019 do Ministério da Saúde). In ACS, the primary treatment is directed at the causes to relieve symptoms and limit myocardial damage. To this end, the "chest pain" protocol of the National Institute of Medical Emergency (INEM) is followed, where the physician indicates the strategy to be implemented after validation of the ECG. Other protocols can also be used depending on the patient's needs and health status. The treatment of choice in an out-of-hospital setting involves the administration of acetylsalicylic acid (ASA), isosorbide dinitrate (ISDN),

morphine, and P2Y12 inhibitors (INEM, 2020). In this context, the intervention of ILS ambulance nurses is crucial given their skills to provide quality care.

Research question

What is the out-of-hospital response time and the role of the ILS ambulance nurse in cases of ACP in people with suspected ACS in two districts in the interior north of Portugal?

Methodology

This is an observational, analytical, cross-sectional, retrospective, and quantitative study about out-of-hospital nursing care to critically ill patients. The population refers to activations of ILS ambulances (ILS 1 and ILS 2) for adult patients with ACP in two districts located in the northern interior of Portugal between June 2017 and December 2018, totaling 94 activations. Both ambulances are allocated to regions with similar characteristics, namely populations with a very high aging rate living in remote mountainous regions. Their area of intervention is broad, which often requires them to travel long distances before arriving at the scene of an incident and subsequent transfer to specialized hospitals with PPCI services. Exclusion criteria were the deactivation of the ILS ambulance by the CODU, patient refusal of transport, a blank record sheet/computer anomaly, and a victim in cardiopulmonary arrest when the ambulance arrived. After applying the exclusion criteria, a sample of 75 activations for ACP cases was obtained. The data collection instrument was built for this purpose, based on a literature review and the INEM's "chest pain" protocol. The protocol guides the actions of ILS ambulance nurses in chest pain situations. It describes the attitudes, interventions, and procedures to be carried out by the nurse, whether they are immediate (lifesaving) or to relief symptoms. The data collection instrument was analyzed by two specialists in the field who issued a positive opinion.

The following variables were defined: out-of-hospital response time (from activation of ILS ambulances to arrival at the scene - T1; from arrival at the scene to start of treatment - T2; from start of treatment to arrival at the Emergency Department (ED) - T3; from arrival at the scene to arrival at the ED - T4; and from activation to arrival at the ED - T5); the nurse's performance - with regard to the protocols followed during care delivery (chest pain, approach to the victim, dyspnea, among others), pain assessment (intensity, type, time since onset, location, radiation, triggering factors, relieving factors, associated symptoms), the ECG, the drugs administered and their repetition, the verification of symptom improvement, and the identification of complications, whether or not the nurse monitored people with ACP, with suspected or confirmed ACS, and the participation in the activation of the VVC; sociodemographic data (age and gender); previous cardiovascular risk profile (verifiable - cardiovascular diseases, AMI, stroke, angioplasty/PPCI); cardiovascular risk factors (verifiable - hypertension, DM, obesity, alcoholism, smoking). The data collection instrument included a set of questions to assess these variables. This study was previously submitted to an Ethics Committee, which approved it (Opinion no. 132/2023). Authorization was obtained from INEM to carry out the research and to access the data. An internal manager was appointed who sent the data anonymously. Data were analyzed using the IBM Statistical Package for the Social Sciences for Windows, version 26. Descriptive and inferential statistical techniques were used. Absolute and relative frequencies, measures of central tendency, and measures of dispersion were calculated. The Chi-square test of independence was used to determine the existence of statistical significance between qualitative variables. The assumptions for using this test were a large sample size and a maximum of 20% expected frequencies of less than 5. If these assumptions were not met, Fisher's exact test was used. The parametric student *t*-test was used to analyze out-of-hospital response times by the ILS ambulance. If the assumptions for its use were not met, the nonparametric Mann-Whitney test was used, with a significance level of 5% (Pestana & Gageiro, 2014).

Results

Of the 75 ILS ambulance activations for ACP cases, the majority (n = 43; 57.3%) were for male patients. This predominance was also found in each of the ILS ambulances (1 and 2). Table 1 characterizes the sample according to age. For the total sample, the mean age was over 70 years (70.32 ± 14.62), with a median of 73, a minimum of 39, and a maximum of 97. A higher mean age was found in the ILS 2 ambulance (72.08 ± 14.26 years), with a median of 76 years, but without statistical significance. Considering the age by gender of the patients treated in the ILS ambulances, a statistically significant difference (p = 0.013) was found for ILS 2, in which females had a higher mean and median age (M ± SD = 76.81 ± 12.59 and Md = 81.50 years).

Table 1

Minimum and maximum values, measures of central tendency, and measures of dispersion of the sample's age by ILS ambulance and gender

ILS Ambulance	Gender	Age			Mann-Whitney Z Test (*p*)	Mann-Whitney Z Test (*p*)
		Min - Max	*M* ± *SD*	*Md*		
ILS 1	Male	48 – 87	65.00 ± 13.34	59.00	-0.584 (0.559)	-1.536 (0.124)
	Female	44 – 97	68.17 ± 19.61	62.50		
	Total	44 – 97	65.90 ± 14.93	61.00		
ILS 2	Male	39 – 93	67.52 ± 14.51	70.00	-2.485 (0.013)	
	Female	50 – 94	76.81 ± 12.59	81.50		
	Total	39 – 94	72.08 ± 14.26	76.00		
Total		39 – 97	70.32 ± 14.62	73.00		

Note. ILS = Immediate Life Support; Min = Minimum; Max = Maximum; *M* ± *SD* = Mean ± Standard deviation; *Md* = Median; Z (*p*) = Mann-Whitney test (significance level).

In the majority of the sample, the distance from the headquarters to the scene was ≥ 15 km (95.5% in ILS 1; 81.1% in ILS 2). Regarding (verifiable) cardiovascular risk factors by ILS ambulance, cardiovascular disease was present in the majority of the sample (57.3%; ILS 1: *n* = 13; ILS 2: *n* = 30). AMI was found in 13.3% of patients (ILS 1: *n* = 2; ILS 2: *n* = 8), and 8% had already undergone angioplasty (ILS 1: *n* = 1; ILS 2: *n* = 5). As for (verifiable) modifiable cardiovascular risk factors, hypertension was the most common (62.7%; ILS 1: *n* = 13; ILS 2: *n* = 34), followed by dyslipidemia (32%; ILS 1: *n* = 3; ILS 2: *n* = 21) and DM (12%; ILS 1: *n* = 3; ILS 2: *n* = 6).

With regard to out-of-hospital response times at the different stages of the rescue process (Table 2), a mean time of 30.05 ± 10.64 minutes was found in ILS 1 between activation and arrival at the scene (T1) and 27.15 ± 14.44 minutes in ILS 2. The time between arrival at the scene and start of treatment (T2) was very similar in both ambulances: 9.89 ± 10.46 minutes in ILS1 and 9.52 ± 7.32 minutes in ILS 2. The mean time between start of treatment and arrival at the ED (T3) was 49.33 ± 13.924 minutes in ILS 1 and almost an hour in ILS 2 (59.03 ± 28.303 minutes). The mean time from arrival at the scene to arrival at the ED (T4) was longer in ILS 2 (70.76 ± 30.05 minutes) than in ILS 1 (61.67 ± 17.56 minutes). On the other hand, the total response time from activation to arrival at the ED (T5) was identical in both ILS ambulances: 95.83 ± 18.61 minutes in ILS 1 and 95.22 ± 38.17 minutes in ILS 2. No statistical significance was found in the times observed for the ILS ambulances ($p > 0.05$).

Table 2

Out-of-hospital response times at the different stages of the rescue process in cases of ACP in patients with suspected ACS, in ILS 1 and ILS 2 ambulances

Time (minutes)	ILS Ambulance	Min - Max	*M* ± *SD*	*Md*	*t*-test T (*p*)
Activation and arrival at the scene (T1) ***(T1)***	**ILS 1**	12 – 50	30.05 ± 10.64	28.00	-1.158* (0.247)
	ILS 2	2 – 61	27.15 ± 14.44	24.00	
Arrival at the scene and start of treatment ***(T2)***	**ILS 1**	1 – 49	09.89 ± 10.46	6.00	-0.529* (0.597)
	ILS 2	1 – 39	09.52 ± 07.32	9.50	
Start of treatment and arrival at the ED ***(T3)***	**ILS 1**	31 – 74	49.33 ± 13.92	47.00	-1.577 (0.123)
	ILS 2	17 – 113	59.03 ± 28.30	58.00	
Arrival at the scene and arrival at the ED ***(T4)***	**ILS 1**	37 – 90	61.67 ± 17.56	58.50	-1.294 (0.205)
	ILS 2	25 – 134	70.76 ± 30.05	69.50	
Activation and arrival at the ED ***(T5)***	**ILS 1**	66 – 123	95.83 ± 18.61	91.00	0.075 (0.941)
	ILS 2	27 – 166	95.22 ± 38.17	96.00	

Note. ILS = Immediate Life Support; ED = Emergency Department; Min = Minimum; Max = Maximum; *M* ± *SD* = Mean ± Standard deviation; *Md* = Median; T (*P*) = *t*-test statistic (significance level); * nonparametric Mann-Whitney test.

Table 3 shows the out-of-hospital response times at the different stages of the rescue process for patients with NSTE-ACS/STEMI, in both ILS ambulances. At T1, the mean time was 28 ± 9.91 minutes and the median time 24.50 minutes. At T2, the mean time was 16.28 ± 12.20 minutes and the median time 10 minutes. At T3, the mean time was 84 ± 16.11 minutes and the median time 86.50 minutes. At T4, the mean time was 102.66 ± 18.80 minutes and the median time 99 minutes. At T5, which includes the total mission time, the mean time was 131 ± 22.23 minutes and the median time 121 minutes.

Table 3

Out-of-hospital response times at the different stages of the rescue process in cases of ACP in patients with NSTE-ACS (or STEMI)

Time (minutes)	*Min - Max*	*M ± SD*	*Md*
Activation and arrival at the scene *(T1)*	16 – 36	28.00 ± 9.91	24.50
Arrival at the scene and start of treatment *(T2)*	2 – 39	16.28 ± 12.20	10.00
Start of treatment and arrival at the ED *(T3)*	64 – 101	84 ± 16.11	86.50
Arrival at the scene and arrival at the ED *(T4)*	85 – 134	102.66 ± 18.80	99.00
Activation and arrival at the ED *(T5)*	111 – 155	131 ± 22.23	121.00

Note. Min = Minimum; *Max* = Maximum; *M* ± *SD* = Mean ± Standard deviation; *Md* = Median; ED = Emergency Department.

The ACP protocol was used in 98.7% of the sample, along with other necessary protocols (approach to the victim = 89.3%, dyspnea = 5.3%, among others with a lower percentage). The assessment of pain in all its variations, characteristics, and dimensions also plays an important role in this context. The application of the Numerical Rating Scale revealed that intensity 8 was the most common type (14.67% of the sample; ILS 1: *n* = 3; ILS 2: *n* = 8). Chest discomfort was the most common symptom (29.3% of the sample; ILS 1: *n* = 10; ILS 2: *n* = 12), followed by tightness (16% of the sample; ILS 1: *n* = 3; ILS 2: *n* = 9), and heaviness in the chest (12% of the sample; ILS 1: *n* = 2; ILS 2: *n* = 7). The time between the onset of symptoms and the call for help was less than two hours in 29.3% (ILS 1: *n* = 9; ILS 2: *n* = 13) of cases, between 2 and 12 hours in 9.3% (ILS 1: *n* = 1; ILS 2: *n* = 6), and more than 24 hours in 8% (ILS 1: *n* = 2; ILS 2: *n* = 4). Pain was retrosternal in 45.3% (ILS 1: *n* = 9; ILS 2: *n* = 28) of the missions and in the epigastric region in 17.3% (ILS 1: *n* = 4; ILS 2: *n* = 9). It should be noted that 42.7% (ILS 1: *n* = 7; ILS 2: *n* = 25) of patients reported that their pain did not radiate, 8% (ILS 1: *n* = 2; ILS 2: *n* = 4) reported that it radiated to the left upper limb, and 6.7% (ILS 1: *n* = 1; ILS 2: *n* = 4) to the back. As for triggering factors, most participants (58.7%; ILS 1: *n* = 14; ILS 2: *n* = 30) reported not feeling any, 77.3% (ILS 1: *n* = 16; ILS 2: *n* = 42) reported there was no relieving factor, and 66.7% (ILS 1: *n* = 16; ILS 2: *n* = 34) said they had no associated symptoms.

An ECG was performed on 97.3% of the sample (ILS 1: *n* = 22; ILS 2: *n* = 51). Eight patients with STEMI were identified (ILS 1: *n* = 2; ILS 2: *n* = 6), corresponding to approximately 11% of all patients with an ECG and 10.66% of the sample analyzed. There was one case of NSTEMI in ILS 1. Other potentially life-threatening dysrhythmias were identified in 15.1% of the sample. A statistically significant association (p = .013) was found between ECG changes and ILS ambulances, with ILS 2 missions having a higher percentage of patients with STEMI and other dysrhythmias (Table 4).

Table 4

ECG changes by ILS ambulance

ECG Changes	ILS Ambulance		Total	Independence Test
	ILS 1 - *n* (%)	ILS 2 - *n* (%)	*n* (%)	F (*p*)
No changes	19 (86.4%)	34 (66.7%)	53 (72.6%)	
STEMI	2 (9.1%)	6 (11.8%)	8 (10.9%)	
NSTEMI	1 (4.5%)	0 (0.0%)	1 (1.4%)	8.117 (0.013)
Others*	0 (0.0%)	11 (21.6%)	11 (15.1%)	
Total	22 (100%)	51 (100%)	73 (100%)	

Note. ILS = Immediate Life Support; STEMI = ST-elevation myocardial infarction; NSTEMI = Non-ST-elevation myocardial infarction; * Pacemaker Rhythm, Flutter, Tachycardia; Atrial fibrillation rapid ventricular response – AFib with RVR, Bradycardia; ECG = Electrocardiogram; F (*p*) = Fisher's exact test of independence (significance level).

ASA was administered to 21.3% of the sample (ILS 1 *n* = 2; ILS 2 *n* = 14), ISDN to 22.7% (ILS 1 *n* = 2; ILS 2 *n* = 15), morphine to 18.7% (ILS 1: *n* = 4; ILS 2: *n* = 10), and clopidogrel to 10.6% (ILS 1: *n* = 2; ILS 2: *n* = 6). Symptoms improved in 72% of the sample (ILS 1: *n* = 17; ILS 2: *n* = 37), and the majority (52%; ILS 1: *n* = 10; ILS 2: *n* = 29) did not need to repeat the medication. In this sample, 74.4% (ILS 1: *n* = 16; ILS 2: *n* = 40) of transports of patients with ACP with suspected or confirmed ACS were performed with the assistance of the ILS ambulance nurse, of which 14.6% (ILS 1: *n* = 3; ILS 2: *n* = 8) were to hospitals with the capacity to perform cardiac catheterization. The VVC was activated in 13.3% of the cases. Although there were no complications during the work of the ILS ambulance nurse in any of the missions, there was one case of dysrhythmia and two cases of hypotension in ILS 2 ambulance.

Discussion

The sociodemographic characteristics are similar to those in Ribeiro's study (2020), with a higher number of male participants with ACS (73.1%) and a mean age of 65 years. With regard to geographical characteristics, the distance from the headquarters to the scene was higher than or equal to 15 km in 64% of the missions in both ILS ambulances. The northern interior regions analyzed in this study have a high aging rate, which explains the high mean age of the sample, a low population density, with small groups of people scattered over large areas, and mountainous regions with poor access roads. As for the presence of (verifiable) cardiovascular diseases in the majority of the sample, it should be noted that an increase in age is associated with an increase in cardiovascular diseases. Conversely, according to Santos and Timmerman (2018), these diseases are the most common causes of chest pain. With regard to the (verifiable) cardiovascular risk factors, the results are similar to those of Bourbon et al. (2019), who found a prevalence of hypertension (43.1%), dyslipidemia (31.3%), and DM (8.9%). It should be noted that 83% of people had two or more cardiovascular risk factors, while Bourbon et al. (2019) found 68%. The out-of-hospital response time at the different stages of the rescue process showed that the ILS ambulances have a close/similar time in T1 and T2. These times are not aligned with Ribeiro (2020), who found mean times of 9 minutes in T1, 4 minutes in T2, 46 minutes in T3, 48 minutes in T4, and 68 minutes in T5 in an emergency medical department in central Portugal. It should be noted that the out-of-hospital response time for patients with STEMI in both ILS ambulances was 28 minutes in T1, 16.28 minutes in T2, 84 minutes in T3, 102.66 minutes in T4, and 131 minutes in T5, 11 minutes higher than recommended (<120 minutes). Mendes (2017) found that 76% of the sample arrived at the ED in more than 120 minutes. Ribeiro (2020) found much lower values, with a mean time of 10 minutes in T1, 3 minutes in T2, 48 minutes in T3, 50 minutes in T4, and 71 minutes in T5. The "chest pain" protocol was widely used (98.7%), as well as others made available and updated by INEM (Despacho n.º 4163/2019 do Ministério da Saúde). These protocols are based on evidence, guide practices, and contribute to the quality of care. According to Bonaca and Sabatine (2022), the assessment of pain in all its aspects is essential to evaluate and diagnose the patient with ACP. The most common type of pain was chest pain. Camacho et al. (2023) found a prevalence of chest pain in 70% of out-of-hospital ACS cases in Autonomic Region of Madeira. In this study, 29.3% of patients reported feeling pain for less than two hours. Silva dos Santos and Timmerman (2018) state that only 20% of people with ACS seek help within the first two hours. With regard to the location of pain, 45.3% of patients reported that it was retrosternal, which is consistent with the findings of Carvalho et al. (2022), who argue that retrosternal chest pain is the most common symptom (80%) in ACS. Regarding the irradiation of pain, 42.7% of patients indicated that they did not experience it and 8% reported feeling irradiation to the left upper limb, as observed by Mendes (2017). The majority (58.7%) did not report any triggering factors. Meira et al. (2021) argue that chest pain usually occurs at rest, without clear triggering factors. The same authors found no references to relieving factors, which are not usually associated with ACS. The majority (66.7%) reported the absence of associated factors, although some individuals reported dyspnea, diaphoresis, lipothymia, and nausea/vomiting, as previously noted by Meira et al. (2021) and Carvalho et al. (2022). A total of 97.3% of missions included an ECG, with the majority of results demonstrating no changes. The ECG identified one case of STEMI (10.66%) and one case of NSTEMI. Other rhythms (14.6%) with the potential for seriousness were also identified. Ribeiro (2020) found that 62.1% of the sample had a sinus rhythm, 16.6% had other rhythms with seriousness criteria, and 5.3% exhibited STEMI. First-line pharmacological treatment included the administration of ASA (21.3%), ISDN (22.7%), morphine (18.7%), and clopidogrel (11%). Ribeiro (2020) found that ASA (100%), ISDN (53.8%), and morphine (30.8%) were administered, and clopidogrel was replaced by ticagrelor (73.1%), which was the second most administered drug. The majority (72%) of patients showed an improvement in symptoms, reflecting a limitation in cardiac effort and the extent of myocardial necrosis (Carvalho et al., 2022). More than half of the sample did not repeat medication. This study found that 74.7% of patients with ACP were accompanied by the ILS ambulance nurse. The VVC was activated in 13.3% (*n* = 10) of the cases, which is consistent with the study by Ribeiro (2020) where it was activated in 14 missions. It was also found that 12% of transports of patients with NSTE-ACS were to hospitals with cardiac catheterization services. Several complications can occur in ACS, namely conduction disorders (90%; Sweis & Jivan, 2022). This study identified two cases of hypotension and one case of dysrhythmia. Camacho et al. (2023) found that dysrhythmia and hypotension occurred in 17% of missions. Nurses play an important role in establishing the diagnosis, identifying and managing

symptoms and complications, as well as participating in the activation of the VVC. The small size of the sample, the context, and the data collection period make the results unrepresentative.

Conclusion

All the missions took place at a distance of 15 km or more. Out-of-hospital response times for patients with suspected ACS who presented with ACP were long, as were response times for patients with STEMI, where the total mean time for both ILS ambulances was 131 minutes, exceeding the recommended time for PPCI by 11 minutes. The "chest pain" protocol was the one most frequently used by nurses. The most common type of pain was retrosternal chest pain that did not radiate. The duration of pain from the onset of symptoms to the call for help usually did not exceed two hours. An ECG was performed in almost all missions. Although most ECGs showed no changes, there were early signs of STEMI and other changes with a high potential for seriousness. Pharmacological treatment followed the recommendations, with an improvement in symptoms. In most cases, the ILS ambulance nurse accompanied the person with suspected or confirmed ACS. In addition to the importance of the nurse's role in diagnosis and symptom management, it became clear that there is a need to reflect, together with the competent authorities, on strategies to reduce total out-of-hospital times and enable these populations to integrate the recommended therapeutic window, that is, to have rapid access to the preferential resources available in differentiated units to avoid death/sequelae. Given that INEM has updated its protocols in November 2023, further studies should be conducted to assess their effectiveness, identify difficulties, and validate the exceptional work carried out by nurses in this area, in order to continuously improve the quality of care.

Author contributions

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